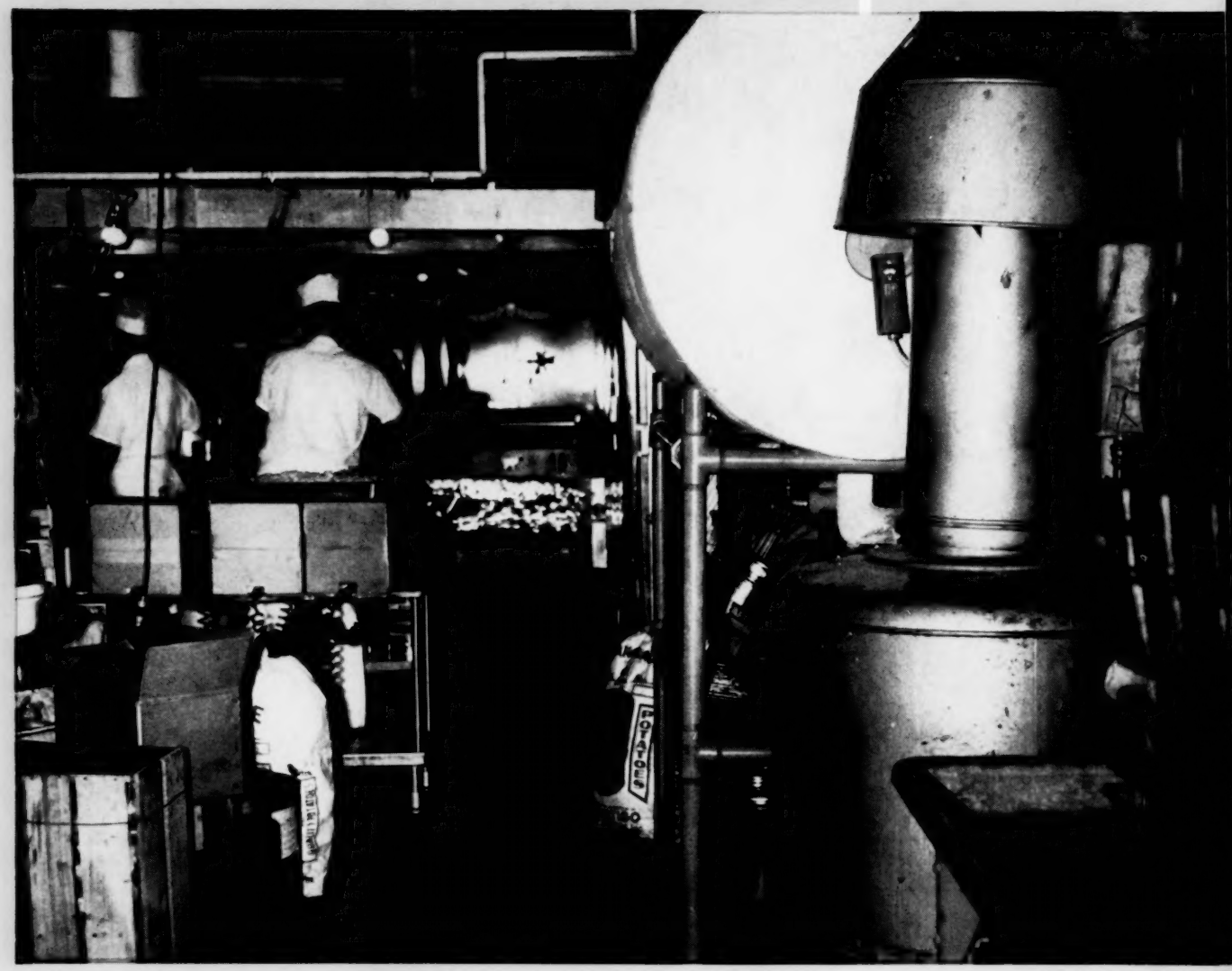
AIR CONDITIONING HEATING AND VENTILATING

MAY 1959

For the Engineer
Engaged in DESIGN
APPLICATION
ESTIMATING
SPECIFICATION
and LAYOUT



Two-temperature hot water for Dobbs House, Franklin Park, Ill., world's largest independent airline caterer, is provided by A. O. Smith-Burkay water heating system. See page 69.

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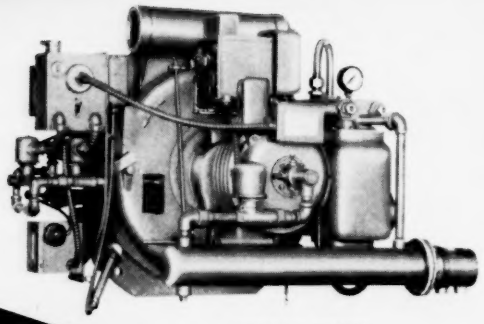
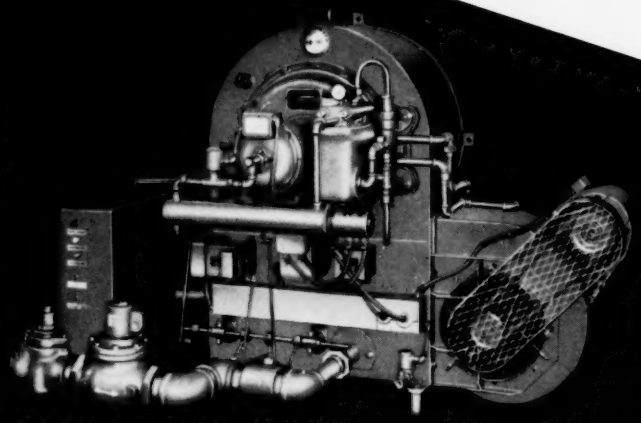
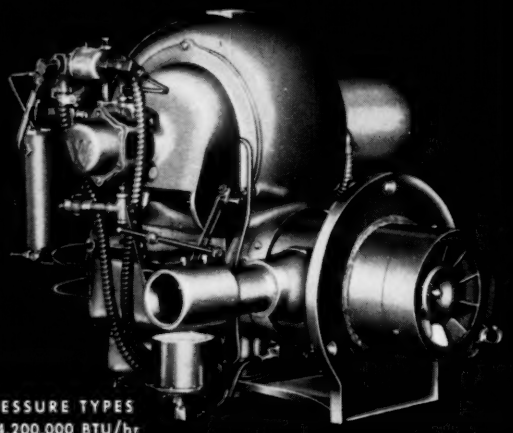


ROTARY TYPES
300,000 to 48,000,000 BTU/hr



FORCED DRAFT TYPES
600,000 to 31,500,000 BTU/hr



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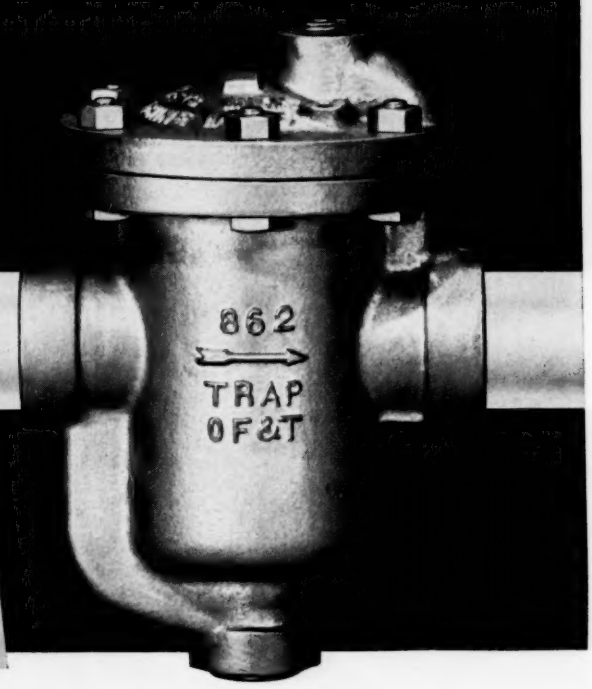

ARMSTRONG OPEN FLOAT AND THERMOSTATIC STEAM TRAPS

Engineered for low pressure intermittent service where large amounts of air accumulate while steam is off

Armstrong O.F.&T. Traps make it possible for heating systems to deliver the efficiency they were designed to deliver. They are ideal for low pressure unit heaters, pipe coils and standing radiation.

Advantages to the user:

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Advantages to the contractor:

LOW COST—Mass production methods permit high quality at low cost.

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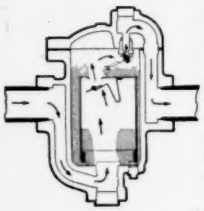
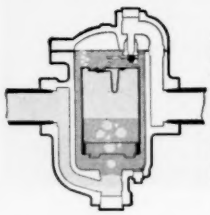
MINIMUM CALL-BACKS—Nothing to stick or clog. Unaffected by ordinary dirt.

UNCONDITIONALLY GUARANTEED TO SATISFY THE USER.

HOW ARMSTRONG O. F. & T. TRAPS WORK:



When steam is turned on, it pushes air through the wide open thermic vent and trap discharge valve at full differential pressure between supply and return lines. Condensate formed by incoming steam goes right through.



As steam reaches open float, thermostatic vent closes. Float fills with steam and rises to close trap valve. Residual air and CO_2 escape through fixed vent at steam temperature.

BULLETIN NO. 775 **BULLETIN NO. 801**

Use the coupon at right to get these helpful bulletins: No. 775 describes O.F.&T. traps fully. No. 801 tells how to select traps for draining unit heaters including data on 30 models of unit heaters.

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Please send me: ☐ O.F.&T. Trap Bulletin No. 775; ☐ Unit Heater Bulletin No. 801.

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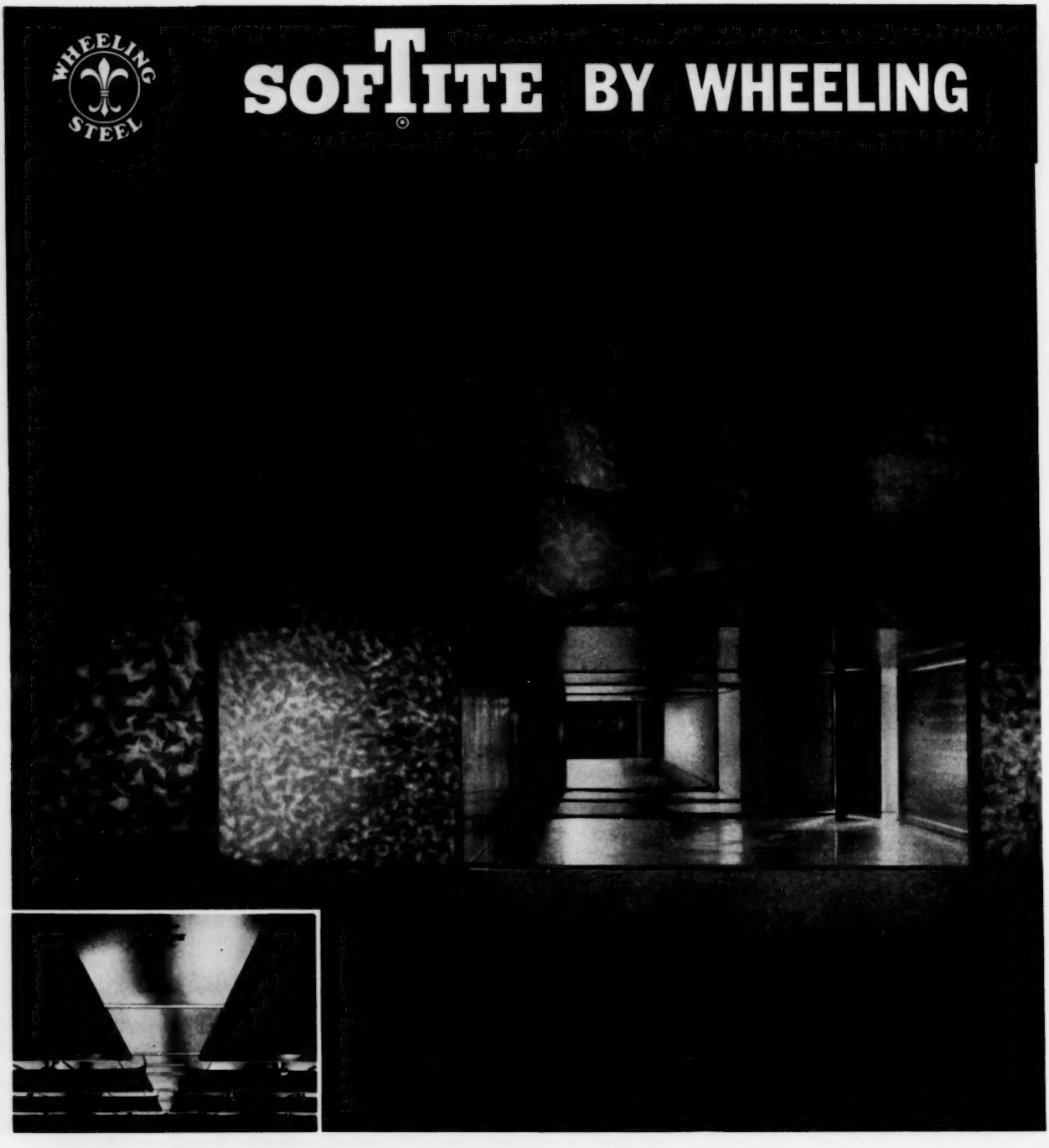

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AIR CONDITIONING HEATING AND VENTILATING

Volume 56, Number 5 **May, 1959**

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HIGH SPOTS

SOME CHANGES OUR READERS WILL FIND USEFUL . . . .

Several changes in physical make-up and arrangement of Air Conditioning, Heating and Ventilating have been made. They are designed to make a useful periodical more easy to use:

Important feature articles are now listed on the front cover. This enables the reader to spot those in which he is most interested and to locate them immediately.

The New Literature department is now fully illustrated. A more attractive, streamlined arrangement of items permits review of its entire contents more rapidly, with spotting in a matter of seconds of those catalogs or bulletins the reader wants.

The reader will find the popular, time-saving Ad-Digest department printed in bigger, more legible type, on white, instead of yellow, paper. Inclusion of two easy-to-use, pre-paid inquiry cards is now a permanent feature.

Redesign of the inquiry card facilitates its use to (1) Bring the reader more information on items covered in News of Equipment and Materials department; (2) Notify manufacturers and others of those catalogs and bulletins, reviewed in New Literature, that the reader wants; (3) Speed inquiries about advertisements in the issue; and (4) Order books on air conditioning, heating, ventilating, piping, and plumbing, published by The Industrial Press.

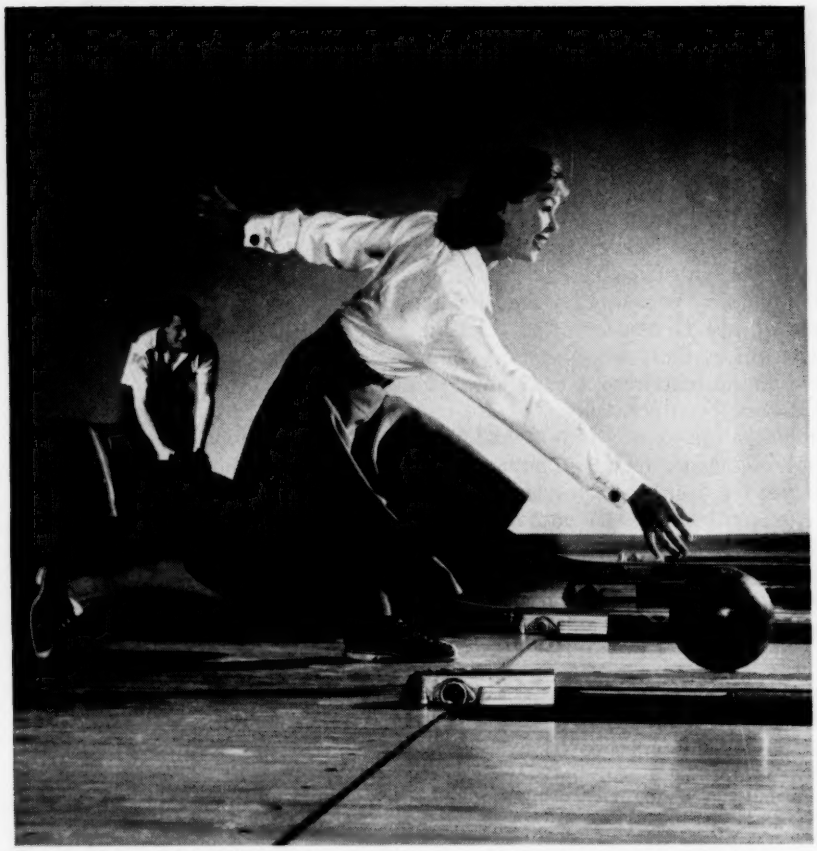
With staple-less binding, the magazine, when opened, stays open at any page. This the reader will find of particular convenience when using material on any one page for a length of time or if he is interrupted in the middle of an article and has to lay the magazine down. Further, those readers who regularly tear out and file articles for reference need no longer wrestle with staples. Pages tear out quite easily. The best method is to open to the page to be torn out. Press the binding absolutely flat. Then tear.

The Data Sheet and Detail Sheet will be printed each month on blue stock, thus readily located without resort to the Table of Contents. Each is scored for easy separation from the magazine for filing purposes.

Juxtaposition of the News of the Month and Briefly Stated departments accomplishes two things: News of significance to engineers may quickly be found near the front of the magazine and scanned. The growing Briefly Stated department, moved to the back, now has adequate space to cover the dozens of items that appear monthly on the doings among the engineers, contractors, and manufacturers: their business matters, associations, and personnel.

No change is made in basic policy. Air Conditioning, Heating and Ventilating continues its coverage of the fields of air conditioning, heating, ventilating, piping, and plumbing, selecting that which is most useful to the designing and specifying engineer in these fields.

In bowling alleys and banks, bakeries and beauty parlors . . . You'll find



The popularity of bowling has increased so sharply in recent years that today more Americans actively participate in bowling than in any other indoor sport. Air-conditioned alleys have made it possible for bowlers to enjoy the game the year round.

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genetron 22 GREEN LABEL $CHClF_2$
MONOCHLORODIFLUOROMETHANE

genetron 113 PURPLE LABEL $C_2Cl_3F_3$
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genetron 114a BLUE LABEL $C_2Cl_2F_4$
DICHLOROTETRAFLUOROETHANE

Air-conditioning is a "must" inside bank vaults, museum and library storage rooms and other areas where, for security reasons, there are no windows or little air circulation. Precise control of temperature and humidity also protects important records against atmospheric variations.

Modern baking is a highly mechanized operation—far removed from grandma's oven. In this photo, crackers pour from the delivery end of an automated travelling oven. Air-conditioning is used in large commercial bakeries today to control temperature and humidity and for employee comfort.

It gets pretty hot under a hair dryer—even *with* air-conditioning. And the girls like to enjoy having their hair done. That's why so many beauty parlors are so well air-conditioned. It benefits customers . . . employees . . . *and* owners!

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WASHINGTON OVERTONES

by LORING F. OVERMAN

● The tug of war between "spenders" and "budget-balancers" continues to be a major overtone as the 86th Congress enters its Spring-Summer session.

Typical is the hassle over the omnibus housing bill, a measure which sends its overtones into the very pocketbooks of those in the heating, ventilating and air-conditioning industries.

● At presstime for this column, a 6-6 vote by the House Rules Committee had blocked efforts to send the Senate-passed bill (S 57) to the floor of the House.

This action—unless a committeeman later changes his vote—duplicates conditions which, during the 85th Congress, resulted in defeat of the measure. At that time, a two-thirds majority vote was required for passage.

House version of bill is considered a $2.1-billion measure by proponents; a $5.8-billion measure by those who oppose. Difference is due to public housing provisions. These would reactivate a 1949 authorization for 810,000 units, some 400,000 of which have been constructed or are under contract.

Present subsidies permit only 145,000 additional units at an annual rate of 35,000 units, but opponents feel that authorizing an additional number would merely be the signal for a move to provide matching financing.

Budgeteers favor continuing FHA authorizations, but would limit some of the proposed fringes—urban renewal and slum clearance, new program of housing aid for the elderly, expansion of military and farm housing programs, increases in special assistance and secondary mortgage programs of the Federal National Mortgage Association, and additional aid to cooperative housing.

● Federal aid to schools was also up for discussion at press time. Subcommittee of House Education and Labor Committee voted to approve a bill (HR 22) authorizing $1.1-billion annually for four years for school construction and teachers' salaries.

Before acting favorably on its $4.4-billion measure, the subcommittee rejected two other proposals. One, an Administration measure, would authorize Federal aid of $2-billion over a 25-year period; the other, by Rep. Lee Metcalf (D.-Mont.), would provide $11.4-billion in aid to states during the next four years.

● New questions of interest to the air-conditioning, heating, ventilating and plumbing industries will be included in the 1960 census of population. Among the first-timers:

There will be questions about air-conditioning, home food freezers, washing machines and dryers, telephones, fuel used for heating water, sources of water supply, and method of sewage disposal.

Omitted from the '60 census will be several questions asked in 1950. These concerned kitchen sinks, mechanical refrigeration, and electricity. Since these items are now considered as standard equipment, the new questions will be substituted.

● A new first-quarter record for private home-building starts has been reported by the Department of Labor. The quarter's total of 295,000 houses and apartment units—288,200 privately owned—was 37% above the first three months of 1958. The seasonally adjusted rate for private housing was up 42%.

The adjusted annual rate for March was 1,390,000, compared with rates of 1,320,000 in February, and 1,350,000 in January. Actual housing starts in March totalled 120,000, or 46% above March of 1958.

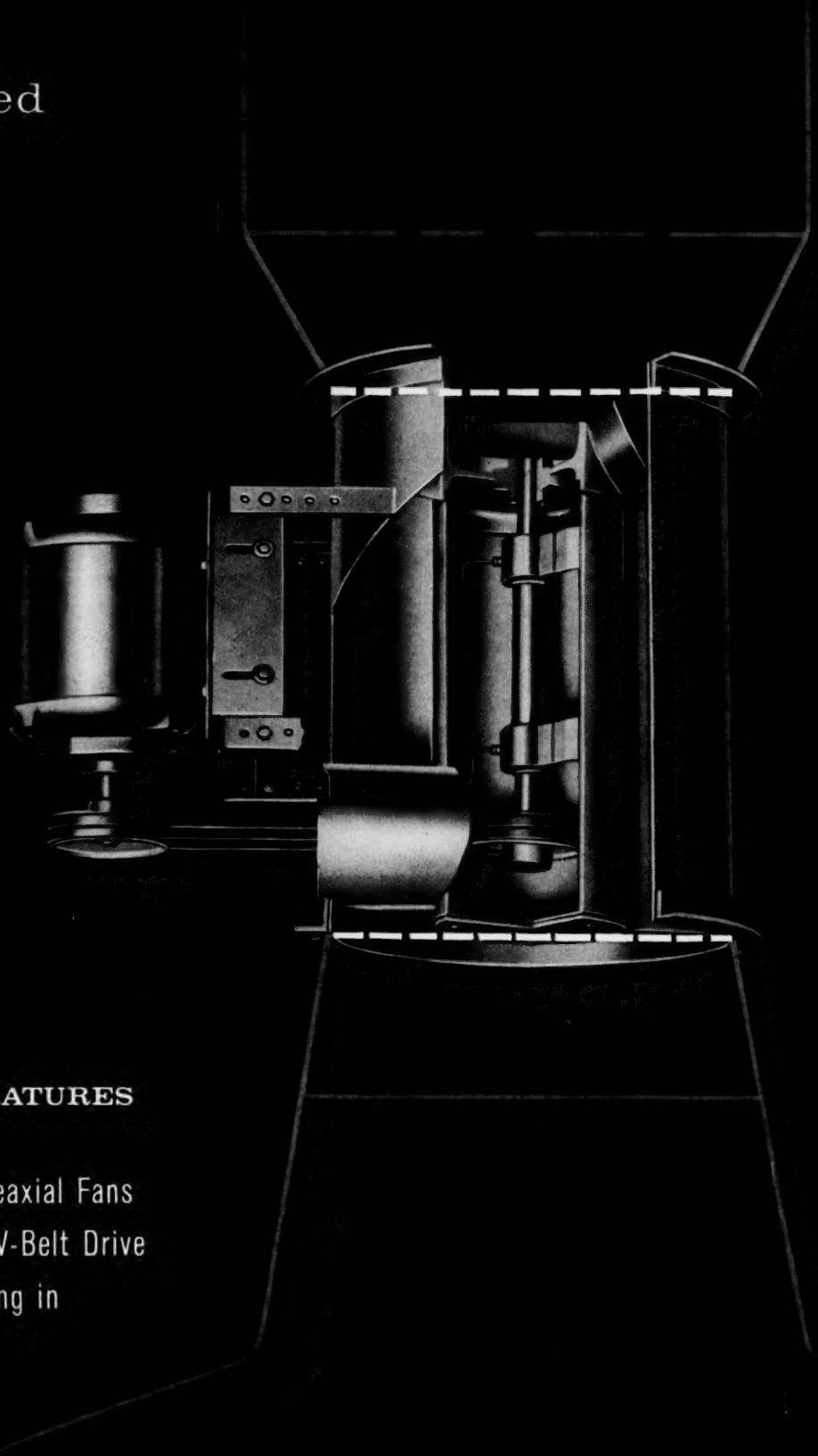
Outlook for home building is still considered favorable, assuming that housing legislation is provided promptly to continue FHA and VA mortgage insurance programs.

(Continued on page 8)

When you need

axial flow fans

for exhaust of fumes and vapors...



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YOU CAN BE SURE...IF IT'S Westinghouse

● Air-Conditioning and heating-ventilating people concerned with Defense Department business may be affected by a new uniform specification for procuring engineering drawings and associated lists for use by military forces.

The new uniform specification (MIL-D-70327), will replace in whole, or in part, 158 specifications previously used by military departments. Use of the new spec is mandatory in preparing drawings for military departments and their contractors.

Copies of the specifications will be available to contractors through military contracting officers, and copies of a related new standard covering types and definitions of engineering drawings (MIL-STD 7) may be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.

● The Federal Reserve Board's index of industrial production rose during March to 147% of the 1947-49 average—a new record two points above the pre-recession high of 145% in August, 1957. FRB also revised the February figure upward to 146%—1% above the preliminary estimate.

Continuation of the trend during the second quarter is anticipated, although forecasters are not so certain about the third period.

● Among the new and increasing uses for blowers and fans is the Army's new five-part Pentadome—an 85 ft high missile maintenance shelter supported entirely by air pressure and constructed of vinyl-coated nylon.

The unit consists of a main dome 150 ft in diameter and 85 ft high, and four smaller domes measuring 100 ft across and 50 ft high. The only support is air pressure, maintained by electric blowers.

The Army explains that the Pentadome was developed primarily as a missile inspection area, but that it may also be used for depot-type storage and temporary shelters for radar and similar equipment. Deflated, the skin could be stored indefinitely.

● A new type of cost-plus-incentive-fee contract which may set a pattern for future defense dealings has been completed by the Navy. The new system, now in use on some plane contracts, provides rewards for exceeding performance targets, as well as the penalties required in the past for defaulting.

● Because of the importance of water to their industries, heating, ventilating and air-conditioning people will find significance in plans to form a select committee to make a broad study of national needs as projected to 1980.

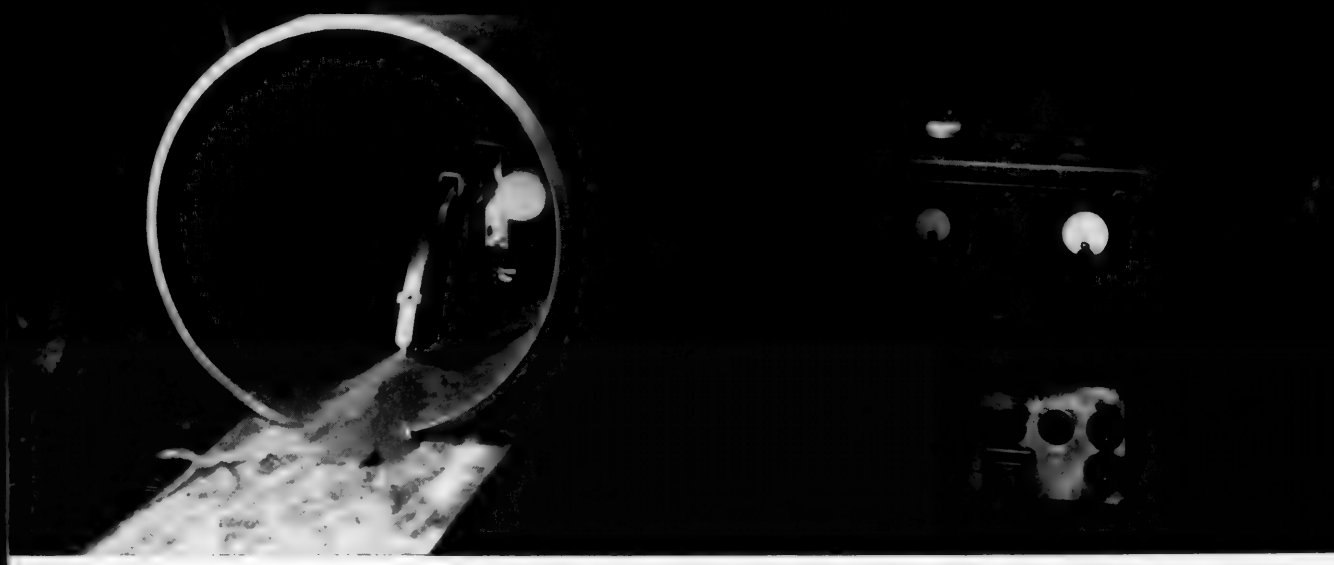
The committee, according to present plans, would consist of representatives from four standing committees of the Senate—Interior and Insular Affairs, Public Works, Interstate and Foreign Commerce, and Agriculture and Forestry.

A report recommending formation of the select committee observes: "A conservative estimate of the water required by 1980 is based on an assumed population of about 210 million, and only a moderate increase in per capita use. Even this estimate calls for a 50% increase in water supplies now available. Other estimates are that by 1980, water needs will increase by 250%."

● Attracting a wider audience of architects, consulting engineers, and other specifiers and buyers of both refrigeration and air conditioning will be the purpose of a conference-type session to be held in conjunction with the 11th ARI Exposition in Atlantic City in November.

Details of the conference, featuring outstanding speakers on air conditioning and refrigeration, will be worked out by a subcommittee consisting of P. M. Augenstein, Airtemp Div., Chrysler Corp.; M. M. Lawler, Worthington Corp.; and R. K. Serfass, Westinghouse Electric Corp.

SELF-FLUXING ACTION OF 4-D WROUGHT IRON CONTRIBUTES TO SOUND, DURABLE WELDS



For superior 4-D Wrought Iron welding results, reduce your welding speed slightly below that used for steel. In electric welding, also reduce the current slightly. With oxy-acetylene welding, a neutral flame is best.

Two-Component Material—4-D Wrought Iron consists of two distinctly different components: high purity iron base metal and glasslike iron silicate. The fluxing action of the silicate protects the base metal during heating. This enables welders to easily produce sound, durable welds.

Melting Characteristics—Each of 4-D Wrought Iron's two components has its own fusion temperature. The siliceous material melts first (2100°-2200°F), several hundred degrees before the iron (2730°F). But don't confuse the fluxing of the iron silicate with melting of the actual base metal. Just continue heating until the iron fuses.

Welding Processes—4-D Wrought Iron Pipe may be easily joined through a number of commonly used welding processes: forge welding, electric resistance welding, oxy-acetylene welding, electric metallic arc, electric carbon arc and submerged arc welding, and bronze welding.

Welding Procedures—Weld slowly enough to allow the siliceous material to float out of the weld. Avoid unnecessary rubbing or agitation of the molten metal. It causes formation of oxides which may be trapped.

Fittings Available—4-D Wrought Iron welding fittings for pipe are available in a complete range of sizes, including bends, Van Stone welding stubs, reducing nipples, tees, crosses, and caps. Fabricators in many cities produce 4-D Wrought Iron welding fittings.

Bonny Forge and Tool Works, Allentown, Pa.; Heat and Power Corp., Baltimore, Md.; Ladish Company, Cudahy, Wis.; Midwest Piping and Supply Company, St. Louis, Mo.; Taylor Forge and Pipe Works, Chicago, Ill.; and Tube Turns, Inc., Louisville, Ky., manufacture extensive lines of 4-D Wrought Iron welding fittings.

Write for comprehensive welding booklet: A. M. Byers Company, Clark Building, Pittsburgh 22, Pennsylvania.

BYERS 4-D WROUGHT IRON

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ALSO AMBALLOY ELECTRIC FURNACE STEELS AND PVC PIPE, SHEET AND ROD STOCK

Corrosion costs you more than Wrought Iron

NEWS OF THE MONTH

RADIANT TEST ROOM

simulates large glass-walled building to test performance of manufacturer's radiant-acoustical ceiling.

A test room to answer the queries of architects and engineers on the ability of a radiant heating system to produce comfort in a room with a large outside glass wall has been built by Airtex Corp., Chicago, Ill. The results of tests conducted in the facility open new uses for radiant heating in modern construction, the company states. Before this test room was built, it is stated, no data were avialable on the capabilities of radiant heating under such conditions.

Specific design of the room was specified by a Chicago architect who asked about the use of the company's radiant-acoustical ceiling in a building having a 22-ft high ordinary glass wall. Conditions were set to simulate conditions in the proposed building. The room duplicated a 20-ft wide section cut out of a much larger building. Ceiling height adjacent to the ordinary ¼-inch plate glass is 22 ft high.

Foil-faced blanket was installed on the sidewalls to simulate adjoining, heated spaces. A twelve-station recording instrument reported on temperature of outside air, room air, floor surface, glass surface, air 3 inches from glass, air one inch from floor, supply and return water of the ceiling panels, boiler water, and supply air.

Test room with radiant ceiling.

• **RESULTS**—Heat loss from the test room was approximately 150 Btu per sq ft. An average room would have a heat loss of approximately 45 to 50 Btu per sq ft, it is estimated. Glass surface temperatures in the test room were between 20 and 22 deg F above the theoretical figure shown in ASHAE *Guide*, the company says. The major significance of the findings, according to Airtex, is that, with a relatively warm glass, down draft off the windows is markedly minimized, although a down draft still exists. When the down draft hits the warm floor, it eddies back up into the space, thereby eliminating the frequent complaint of cold feet and ankles, caused by cold air flowing across them. Also, the higher glass surface temperature enhanced comfort of people close to the glass because of reduced bodily heat radiation.

TEN FIRMS SPONSOR

BRI Conference on Building Illumination to clear misunderstandings arising from new IES standards.

The considerable difference of opinion throughout the building industry and the architectural and engineering professions as to how much light is enough, how much is too much, and what increased lighting levels may do to building design and engineering has prompted ten national organizations to sponsor a Building Research Institute Conference on Building Illumination, May 20 and 21 at the Statler-Hilton Hotel in Cleveland, Ohio.

New levels of illumination for buildings of all kinds proposed by the Illuminating Engineering Society have brought forth a variety of questions by air conditioning engineers, architects, school officials, electrical contractors, and fixture manufacturers, BRI says. To give the industry and its professional associates an opportunity to voice these questions and get some definitive answers, BRI will bring to the platform a cross-section of speakers from all fields concerned, including an internationally recognized expert on daylighting, Dr. J. W. Griffith of Southern Methodist University; the chief of the bureau of school planning for California's Department of Education, Charles Dana Gibson; Robert A. Nevin, chief electrical engineer for the architectural firm of Gargent, Webster, Crenshaw and Folley; E. J. Benesch of the New York engineering firm, Syska and Hennessy, and many others.

• **SPONSORS**—Also, to illustrate graphically the levels of lighting under discussion, demonstrations will be conducted during the conference at the General Electric Laboratories in Nela Park, Cleveland. Firms who will sponsor the conference are: Columbia Electric and Manufacturing Co., Spokane, Wash.; Day-Brite Lighting, Inc., St. Louis, Mo.; General Electric; The Edwin F. Guth Co., St. Louis, Mo.; Owens-Corning Fiberglas Corp., Toledo, Ohio, Rohm & Haas Co., Philadelphia, Pa.; A. L. Smith

(Continued on page 12)

And in New York — A FUTURE OF FAULTLESS SERVICE

THE CHASE MANHATTAN BANK BUILDING
New York, N.Y.

SKIDMORE, OWINGS & MERRILL
architects

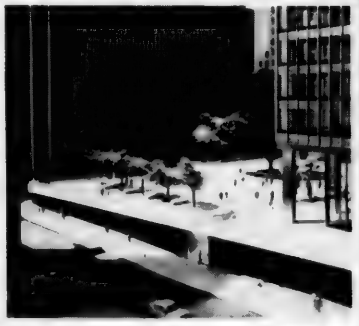
JAROS, BAUM & BOLLES
mechanical engineers

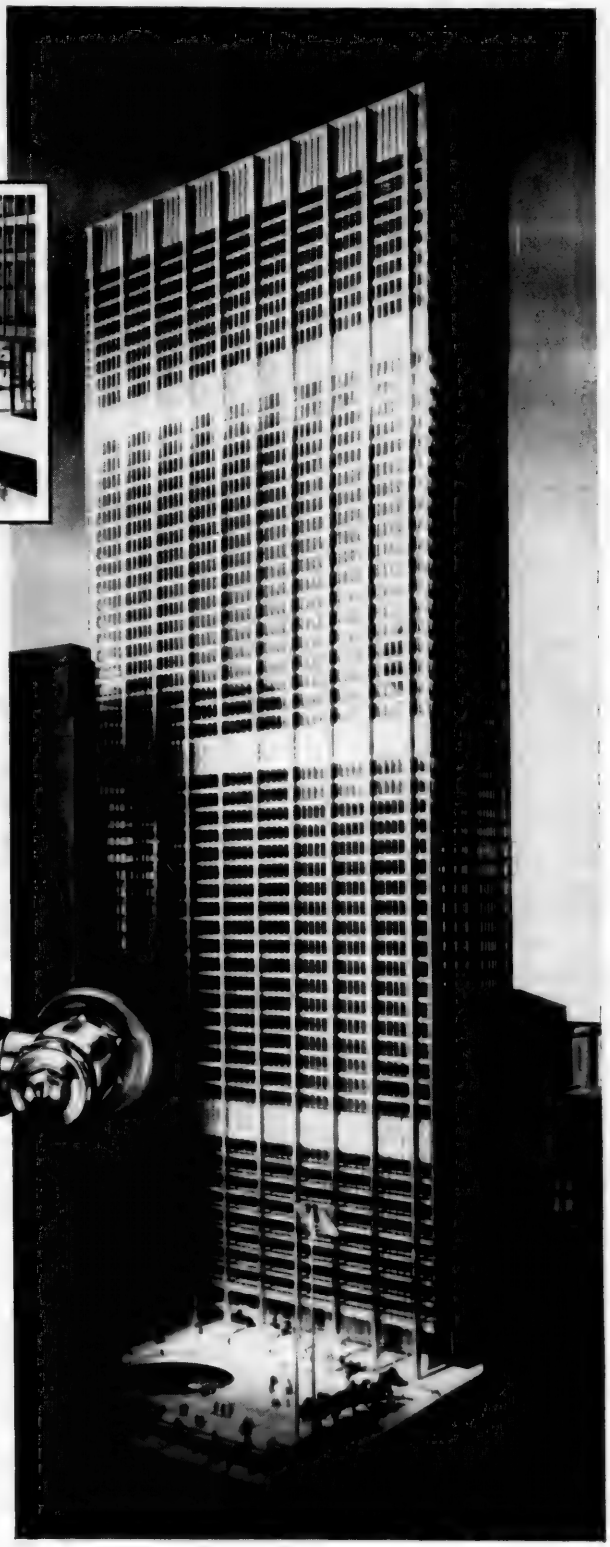
TURNER CONSTRUCTION CO.
general contractor

EUGENE DUKLAUER, INC.
plumbing contractor

GLAUBER, INC.
wholesale distributor

AMERICAN RADIATOR AND STANDARD SANITARY CORP.
plumbing fixtures manufacturer





All of New York's crowded financial district awaits the completion of the stunning Chase Manhattan Bank Building ...another COYNE & DELANY installation...which will provide welcome open space, light and air through its 2½ acre plaza covering two city blocks. Rising 60 stories without setback, the rectangular glass and aluminum tower will house 15,000 workers when work ends in mid-1962. The Chase Manhattan Bank Building is in every sense a pacesetter for future lower Manhattan construction and all equipment was painstakingly culled before specification.

In this quality project, nearly 1,000 DELANY diaphragm type flush valves were selected to supply the satisfying and unflagging service that has made DELANY—"the fastest growing name in flush valves!"

DELANY *Flush* VALVES

Since 1879

COYNE & DELANY CO. • 834 KENT AVE. • BROOKLYN, NEW YORK
IN CANADA: THE JAMES ROBERTSON CO. LTD.

Iron Co., Chelsea, Mass.; Thomas Industries, Inc., Louisville, Ky.; and the Wakefield Company, Vermilion, Ohio.

The unbiased platform provided by the Building Research Institute was chosen for this exchange of ideas and opinions among all factions of the building industry and its related professions, with a view to arriving at conclusions about lighting for tomorrow's buildings that would reflect the needs of all concerned. Open to the interested public as well as to BRI members and guests, this meeting is expected to draw, as well, persons engaged in the operation and maintenance of hospitals, schools and institutions; ophthalmologists and psychologists; interior design and decoration specialists, etc. Complete program information and registration may be obtained from Harold Horowitz, Technical Secretary, Building Research Institute, 2101 Constitution Ave., Washington 25, D.C.

CONSTRUCTION PEACE

is the object of union-contractor organization. Harvard professor is named impartial chairman.

Formation of Construction Industry Joint Conference, Washington, D. C., was announced by Dr. John T. Dunlop, professor of economics at Harvard University and recently named impartial chairman of the Joint Administrative Committee of the Conference.

The new organization is the keystone of a plan adopted after a joint meeting of general presidents of national unions engaged in the construction industry and executives of national associations of general and specialty contractors. Affiliation of each national union or contractor association is subject to its own decision to affiliate.

Stated objective of the Conference is to promote the welfare of the building and construction industry in the public interest. It is designed, say its sponsors, to preserve and to promote the contract system, and it seeks improved performance and productivity by contractors and workers.

The Conference provides a continuing forum in which labor-management and industry problems not subject of existing machinery can be regularly discussed and every effort made to reach constructive and equitable solutions.

It is contemplated by the founders that mutually-agreed-upon methods be devised to insure uninterrupted continuity of work on all projects and contracts.

ULTRASONIC DISHWASHER

halves washing and drying time and eliminates any hand cleaning. Working model at IRE Show.

Ultrasonic sound waves, on the order of 40,000 cycles per second, alternately compressing and decompressing tap water, are utilized in a dishwasher unveiled at the Institute of Radio Engineers Show at the New York Coliseum by Narda Ultrasonics Corp., Westbury, L. I. The conventional washing and drying cycle is cut in half, and stubbornly clinging food particles, which formerly had to be cleaned off by hand, are removed.

• **WORKING MODEL SHOWN**—This is the latest achievement of an industry whose commercial and military sales reached $25 million last year, a volume expected to double in 1959. Not yet ready for the market, the dishwasher displayed was a working model which the company expects to have in production later this year. Called the Vanguard, the unit is a mobile, roll-around unit which can be plugged into any 110-volt electric outlet and hooked up to the normal household plumbing system. It is designed to operate with normal dishwashing detergents and tap water. It is completely automatic.

The 40,000-cycle sound waves alternately compress and decompress the water, causing myriads of small vacuum bubbles to form and collapse with a tremendous force which "blasts off" all traces of contamination from the items being washed.

Ultrasonic machines are used for hospital and military and industrial cleaning and degreasing. One new use is for deaerating boiler feed water.

PLUMBING CODE REVISIONS

needed in many areas to cope with new chemical laboratory installations, sanitary engineer says

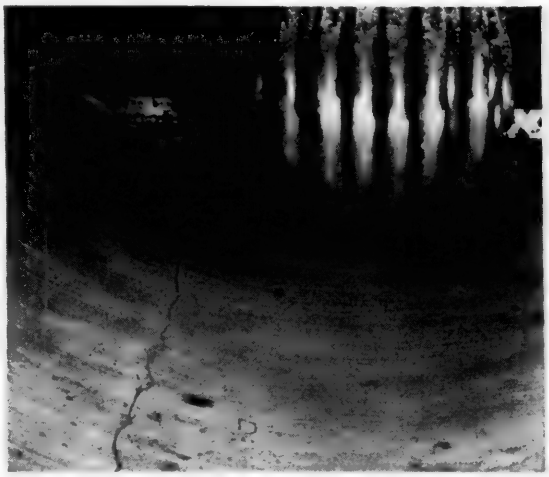
Most plumbing codes need to be studied by a competent code committee and those paragraphs or sections governing chemical laboratory installations brought up to date, according to Homer Yetman, writing in the American Society of Sanitary Engineering's *News Letter*.

Mr. Yetman has inspected quite a number of chemical laboratory plumbing installations recently, in both industrial plants and schools. The drainage and vent systems seemed to run from one extreme to the other, he says, probably because of different code requirements. Many combination waste and vent systems were such in name only, he said, as no provision in venting has been made to balance the system by equalizing the atmospheric pressure at all points.

• **REPORTS HEAVY DAMAGE**—In some installations, Mr. Yetman observed, leaks of corrosive fluids and gases had destroyed floors, walls, and ceilings, as well as some heavy structural members. In a large building, a small testing laboratory using corrosive acids had been installed on one of the upper floors several years after the building was built. Because the plumbing code did not make the use of a proper size neutralizing basin mandatory, he states, none was installed. The results were that the original Durham system stack and a large portion of the vent pipes were completely destroyed in a short time by the corrosive fumes and waste matter.

An increase in chemical laboratory installations is predicted because of many current developments in industry. Mr. Yetman suggests that the ASSE Code Committee give the matter of code revisions its immediate attention and prepare guide suggestions for local plumbing code committees to use in amending their codes.

This unretouched photograph shows what can happen to a storage water heater lining of *ordinary* cement under normal service conditions. Cracking and chipping expose the steel plates to rust and corrosion. This cannot happen with properly applied Pre-Krete.



Of course you can line a steel storage water heater with ordinary cement . . .

Applied Pre-Krete forms a chemically inert, strong and lasting lining on the interior of open or closed steel vessels. Pre-Krete imparts no flavor or discoloration to water and is completely nontoxic.

but here are 4 good reasons why P-K's are lined with

PRE~KRETE®

1. Pre-Krete won't crack

2. Pre-Krete won't chip

3. Pre-Krete gives long, durable protection against rust and corrosion

4. Pre-Krete withstands water temperatures up to 900° F.

Storage water heaters built by P-K and factory-lined with PRE-KRETE are fully guaranteed on workmanship and materials. On-the-site lining is also available through P-K's network of franchised applicators, who use Pre-Krete exclusively. Get the whole story of why you gain immediate and lasting benefits by specifying P-K Storage Water Heaters. Ask for Catalog Number 19. Write to Patterson-Kelley, 1105 Linton Street, East Stroudsburg, Pennsylvania.

2

Patterson Kelley
Water Heater Division

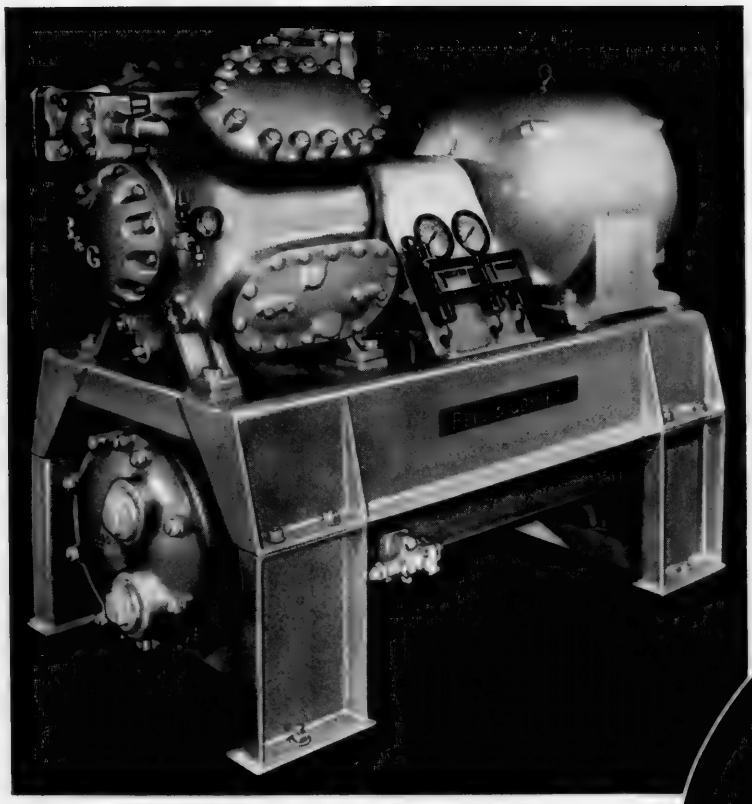
storage water heaters • instantaneous heaters • convertors • water to water exchangers

Scientific Frontiers

• An important forward step in the development of thermoelectric materials for the direct conversion of heat into electricity at high temperatures has been made by scientists at Westinghouse Electric Corp.'s Research Laboratories, in Pittsburgh, Pa. They have developed a thermoelectric material—the most efficient of its type yet discovered—for use in the temperature range from 850 to 1500 deg. F. The new semiconductor material, designed solely for thermoelectric purposes, is a three-element compound known as indium arsenide phosphide. It is prepared by chemically combining high-purity indium with equally pure arsenic and phosphorus. Development of the material fills a gap in the substances which up to now have been available for thermoelectric power generation. It is expected to find immediate use in thermoelectric devices operating at temperatures well above those previously considered practical. Properties of the new material were described on March 30 in a technical paper read before a meeting of the American Physical Society at Massachusetts Institute of Technology, Cambridge, Mass. The paper was presented by Dr. Raymond Bowers, Westinghouse research physicist, who conceived and developed indium arsenide phosphide with the collaboration of Drs. R. W. Ure, Jr., A. J. Cornish, and J. E. Bauerle, also of the Westinghouse Research Laboratories.

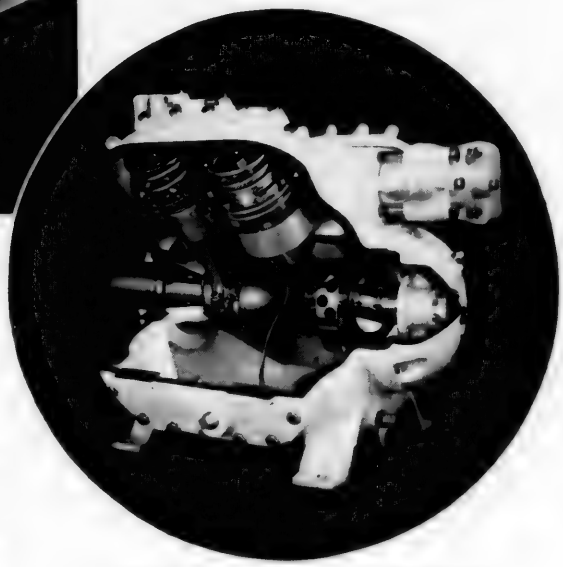
• Mineral and water conservation are two major gains of new waste-disposal process invented by Drs. Harold B. Gotaas, dean of Northwestern University's Technological Institute, and William J. Oswald, University of California. Process consists of: (1) treating sewage in commercial or industrial treatment ponds by methods developed by the Carnegie Institution of Washington and others; (2) growing algae in ponds to retrieve minerals taken from farm soil by food crops and contained in sewage; and (3) after growing period is over, separating algae, humus, and water in settling chambers at ponds' exit ends. Algae are harvested and dried to granular form for use in animal feeds. Humus or sludge is used for adding body to soil. Water is used for irrigation, engine coolant, or after further treatment is channeled back into the community's water supply for household use. Nutrients in dried algae include protein, 45 to 55%; minerals, 15 to 20%; fats, 10 to 20%; and carbohydrates, 15 to 25%.

• E. I. du Pont de Nemours & Co. reports its development of a new plastic called Delrin, which it said should shape up as a major competitor to metals such as steel, brass, zinc, and aluminum in a wide variety of uses. Characterizing Delrin as the first usable polymer of formaldehyde, du Pont put heavy emphasis on its strength and rigidity. Molecular structure of the material is such that it forms in molecular chains without branches, as is the case with the linear polyethylenes. Moreover, groups of parallel chains of Delrin tend to pack together neatly and to hold together tightly due to "internal crystal forces" similar to those found in the composition of metals. The new material is a thermoplastic and can be easily formed on standard high-speed automatic molding equipment into many intricate shapes. Many probable uses are suggested, such as carburetor parts, gears, bearings and bushings, cameras and appliances, pipe, faucets and other plumbing fixtures, and a diversity of consumer products.



AN ACHIEVEMENT IN COMPACT, *QUIET* EFFICIENCY... WITH ALL MAJOR PARTS MADE AND GUARANTEED BY

BELL & GOSSETT COMPANY



Cut-away view of Condenser Compressor

B&G CONDENSING UNIT

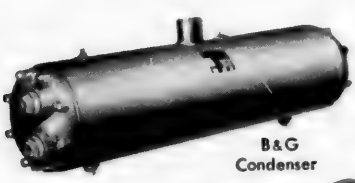
There are numerous, well-defined reasons why this B&G Condensing Unit is the outstanding buy in air conditioning and refrigeration equipment. An impressive list of features, many of them exclusive, are engineered into the shortest unit on the market today—with capacities ranging from 7½ through 150 tons.

Not the least of the reasons is the fact that all major components are built in the B&G plant—*hence covered by a single manufacturer's guarantee!*

The B&G Package Liquid Cooler is another matched unit—a completely integrated and assembled water chiller. In capacities from 7½ through 150 tons, the components of this chiller give a complete capacity-engineered combination of chassis, motor, compressor and automatic control obtainable nowhere else. Everything included—no extras to buy.

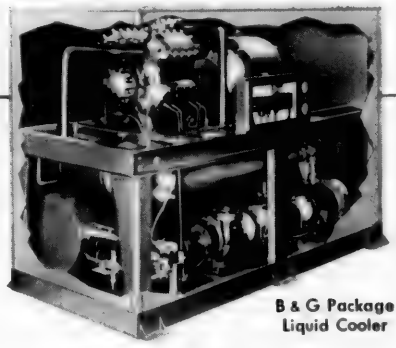
Send for descriptive literature and engineering data.

A FULL LINE OF REFRIGERATION AND AIR CONDITIONING COMPONENTS

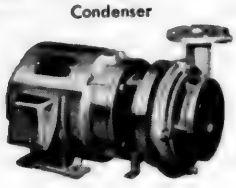


B&G Condenser

B&G Evaporator



B & G Package Liquid Cooler



B&G Centrifugal Pumps

Reg. U.S. Pat. Off.

BELL & GOSSETT COMPANY

Dept. RFS-4, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

Johnson Controls Provide Ideal Working Climate in This Award-Winning Plant

Listerine, Richard Hudnut, Du Barry and other famous name products are made here. Johnson Controls keep this air conditioned packaging area as comfortable as an executive office.

One of the outstanding assets of the efficient new Lambert-Hudnut plant in Lititz, Pennsylvania, is its physical environment. Its striking design, scenic setting, spacious, bright plant and office areas and excellent employee facilities rate with the best anywhere! *Factory* magazine named it one of the top 10 plants in 1957.

A key feature of this modern environment is a specially planned Johnson Pneumatic Temperature Control System that operates the plant's high velocity, dual duct air conditioning systems, the high temperature (350 F) hot water heating system and the ventilating systems. Flexibly engineered so that each room or work area is individually controlled, the Johnson System assures an ideal working climate for Lambert-Hudnut employees.

Lambert-Hudnut Manufacturing Laboratories, Lititz, Pa., subsidiary of Warner-Lambert Pharmaceutical Co. A. M. Kinney, Inc., architect and engineer, Cincinnati; R. E. Lamb, general contractor, Philadelphia; Howard P. Foley Co., mechanical contractor, Pittsburgh.

Such an environment makes important contributions to working efficiency, helps attract and hold good employees and cut absenteeism and costly turnover. (In many plants, too, products must be handled and processed under closely controlled temperature and humidity conditions.)

A nearby Johnson engineer will welcome the opportunity to demonstrate how Johnson Pneumatic Controls can help provide your clients' buildings with similar benefits. The specialist Johnson organization has installed the pneumatic temperature control systems in a majority of the nation's leading buildings, of all types and sizes.

Johnson Service Company, Milwaukee 1, Wisc. 105 Direct Branch Offices.

GET THE "PLUS" VALUES OF PNEUMATIC CONTROLS BY JOHNSON

- **Widest Application.** Johnson Controls are applied to all types and makes of air conditioning, heating and ventilating equipment, and can meet any comfort or process requirement. Each system is engineered to meet the exact needs of the individual plant.
- **Greater Simplicity.** Pneumatic control involves far fewer and much simpler components than anything else you can use. There are fewer components to check, fewer parts subject to failure.
- **Choice of Features.** Johnson makes the most complete line of pneumatic temperature, humidity and pressure control equipment to match your needs.
- **Reliable Performance.** Johnson Pneumatic Controls are unaffected by short circuits, electrical overloads, voltage variations and humidity. You get continuous, accurate control.
- **Complete Safety** . . . even in the presence of explosive gases, solvents, dusts and other hazardous materials.
- **Dependable Service** . . . Johnson maintains the oldest and largest service organization in the industry. Full time, factory trained service men are on duty in 105 direct branch offices and over 200 other cities.

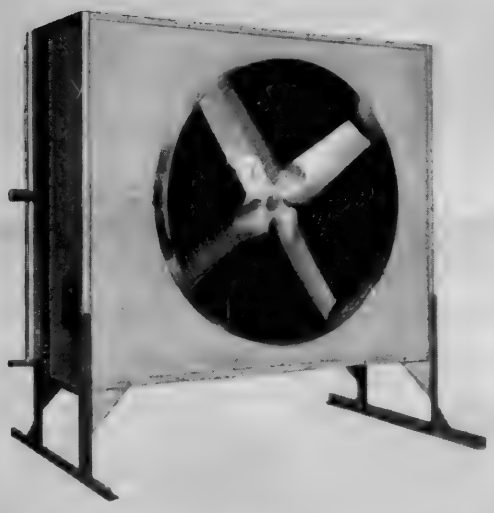
JOHNSON CONTROL

PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

TEMPERATURE CONTROL SYSTEMS FOR SCHOOLS, OFFICES, FACTORIES, STORES, HOSPITALS, HOTELS, PUBLIC BUILDINGS

Vertical Air-Flow Aircon



Horizontal Air-Flow Aircon

8 SIZES 7½ TO **50 TONS** IN A SINGLE UNIT

now
your choice of
VERTICAL or
HORIZONTAL
AIR FLOW AIRCON CONDENSERS

Now McQuay offers you your choice of either vertical or horizontal air-flow Aircons in eight models with capacities from 7½ to 50 tons in a single unit. Unlimited tonnage is available with multiple installations. The vertical air-flow Aircon is designed to meet the needs of the architect as well as the consulting engineer. With an extremely low silhouette, the vertical Aircon is rarely visible when installed on a roof. In addition to this, the vertical air-flow Aircon is not affected by prevailing winds and therefore does not require a wind deflector.

You not only get more models and more capacity, but you get more performance, because McQuay Aircons have the exclusive McQuay Ripple-Fin coils—the finest and the standard of the industry.

The McQuay "Seasontrols," automatic head pressure controls, are available as accessories, and modulate the condenser capacity in accordance with the weather for proper operation at all times. For complete information, call the McQuay representative in or near your city, or write McQuay, Inc., 1619 Broadway St. N. E., Minneapolis 13, Minnesota.

McQuay Means Quality

McQuay INC.

AIR CONDITIONING • HEATING • REFRIGERATION

Skidmore Pumps

2 New Bulletins

MORE CAPACITY

MORE PERFORMANCE

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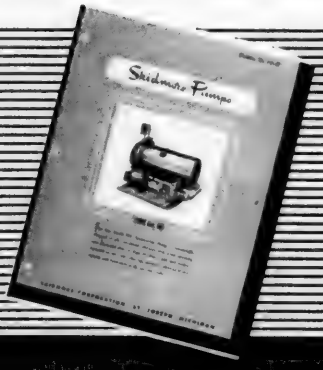
TYPE CCVS



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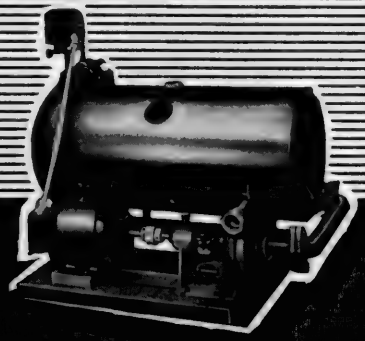


TYPE HS

Since 1921

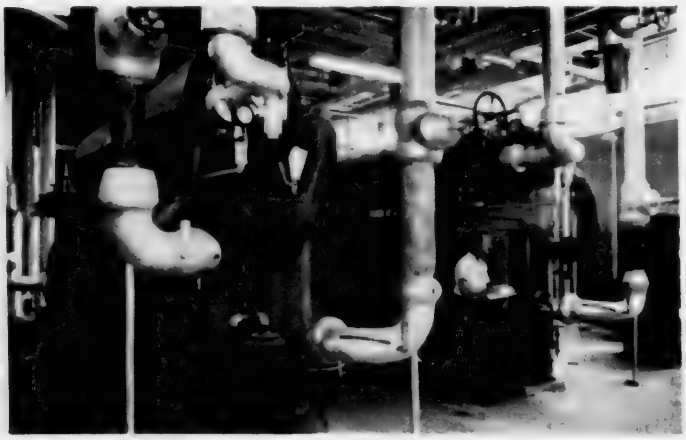
SKIDMORE PUMPS

SKIDMORE CORPORATION

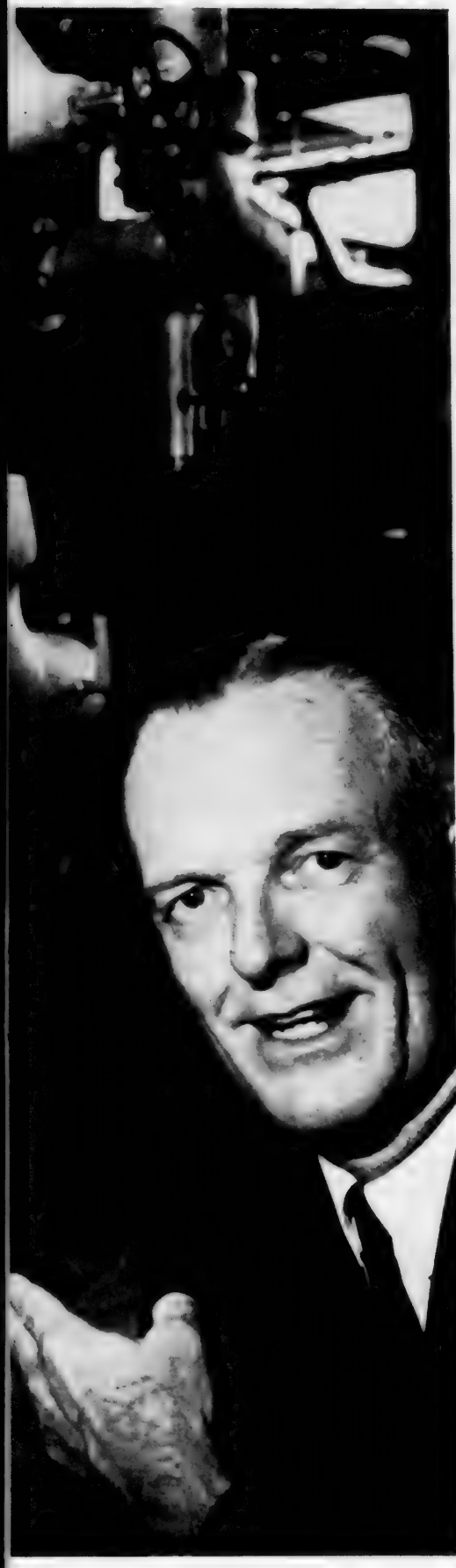
ST. JOSEPH, MICHIGAN

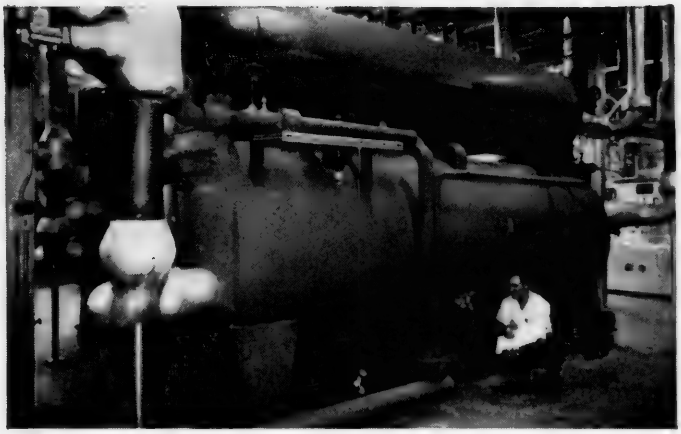
NO SUMMERTIME SLUMP With gas as the boiler fuel and York machines, the switch to summer cooling was no problem. Operating costs are low, too, thanks to Gas.

LATEST IN COOLING Gas operated York machines feature the use of tap water as refrigerant and lithium bromide as absorbent, one of the most efficient, practical refrigeration cycles developed so far. Machines start and stop automatically.



THE UTMOST IN FLEXIBILITY The units are cross-connected so that each operates independently if necessary.





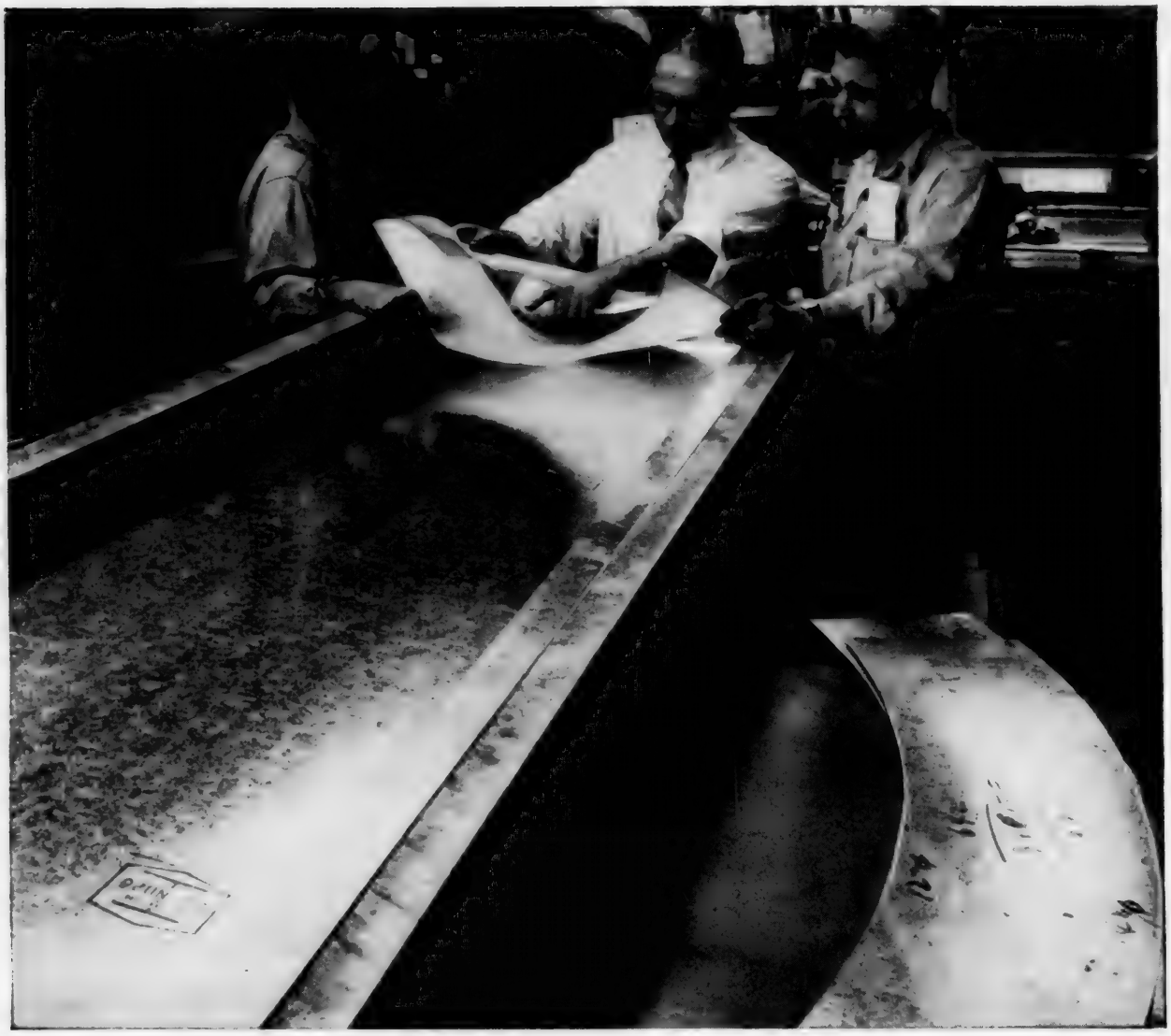
MAINTENANCE COSTS TO DATE—ZERO! The Allen Company uses two York machines—a 230-ton unit serving 45,000 sq. ft. of office and cafeteria space, a 170-ton unit for process water cooling. Three small pumps and motors are the only moving parts in the entire system.

"with **YORK GAS** *air conditioning our boilers keep us cool all summer"*

"With our boilers sized for a winter load, we were naturally oversized for the summer months. But York's gas-operated Lithium Bromide absorption water chillers permit us to make efficient use of part of this steam capacity to cool," says Mr. M. J. Mather, President of the Allen Manufacturing Company, makers of hex-socket screws.

The York Lithium Bromide system eliminates the need for huge compressors found in other types of cooling equipment . . . which brings down the original cost considerably. And with gas the boiler fuel, you make year-round use of an otherwise wasted source of power *at rock bottom costs.* In addition, York machines are noiseless, lightweight, compact—easy to install and readily adaptable to almost any plant layout.

Find out how your present heating system can pay off for you all year 'round with gas-operated York automatic water chilling units. Call your local gas company or write to the York Corporation, Subsidiary of Borg-Warner Corporation, York, Pennsylvania. *American Gas Association.*



"Bethcon looks good, and does a nice job"

That's what one of our new customers volunteered about Bethcon a few weeks ago. He's no metallurgist, so he couldn't elaborate very much on his statement. But here is the probable reason for his enthusiasm:

Bethcon is galvanized in Bethlehem's up-to-the-minute continuous lines at Sparrows Point, Maryland, which include a continuous annealing process. This treatment gives the steel a very desirable combination of ductility and stiffness, which makes for easy workability and a strong, rigid sheet-metal product.

Bethlehem's continuous galvanizing process also causes the zinc to adhere to the steel much more tightly than the conventional method. You can put a Bethcon sheet through the toughest forming operations—even double it back on itself—without cracking or flaking the coating. The coating itself is more uniform, too, with a uniform thickness across the sheet and no bead on the end.

Bethcon is available in gages 13 and up, in either plain open hearth or copper-bearing steel. A Bethlehem representative will be glad to discuss your sheet metal problems with you. Just call or write to the Bethlehem district office nearest you.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

at

Contractor: Roland Thompkins & Son, Inc. Hawthorne, N.Y.

Consulting Engineer: Giffels & Vallet, Inc. Detroit, Mich.

Architect: L. Rossetti Detroit, Mich.

—the Comfort Computation

came out . . .

DUNHAM-BUSH

The Dunham-Bush 'HAH' is designed for ceiling installation which conserves space vitally needed for engineering purposes.

Of course, IBM really didn't employ any of its masterfully precise computers to predetermine whose air conditioning equipment would best serve their new Engineering Laboratory at Kingston, New York.

But all equipment selected was calculated to meet the important demands modern industry must make to ensure personnel comfort and equipment protection.

For example, here at Kingston, 92 engineered Dunham-Bush Horizontal Air Handling units efficiently deliver conditioned air to create the climatic interior that's seasonally required. Dunham-Bush units have operational versatility that enables them to cool, heat, filter, or dehumidify air, according to temperature requirements. Additionally, such Dunham-Bush heating products as finned tube radiation with expanded metal covers, horizontal and cabinet type unit heaters, and F&T traps and strainers are used throughout the laboratory.

Contact your nearest Dunham-Bush sales representative for assistance when your next heating or cooling job arises.

You'll find that this one source—one responsibility is of inestimable value.

Close-up of Dunham-Bush 'HAH' which cools, heats, filters, dehumidifies air.

Dunham-Bush, Inc.

WEST HARTFORD 10 • CONNECTICUT • U. S. A.

DUNHAM-BUSH

AIR CONDITIONING • REFRIGERATION • HEATING • HEAT TRANSFER

WEST HARTFORD, CONNECTICUT • MICHIGAN CITY, INDIANA
MARSHALLTOWN, IOWA • RIVERSIDE, CALIFORNIA

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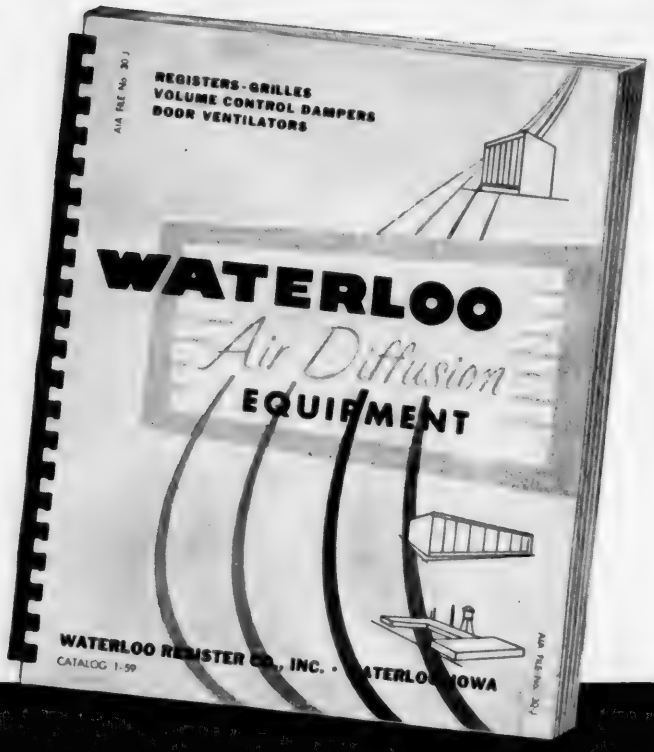
Dunham-Bush DUNHAM-BUSH, LTD., PORTSMOUTH, ENGLAND · BRUNNER BRUNNER CORPORATION (CANADA) LTD., PORT HOPE, ONTARIO

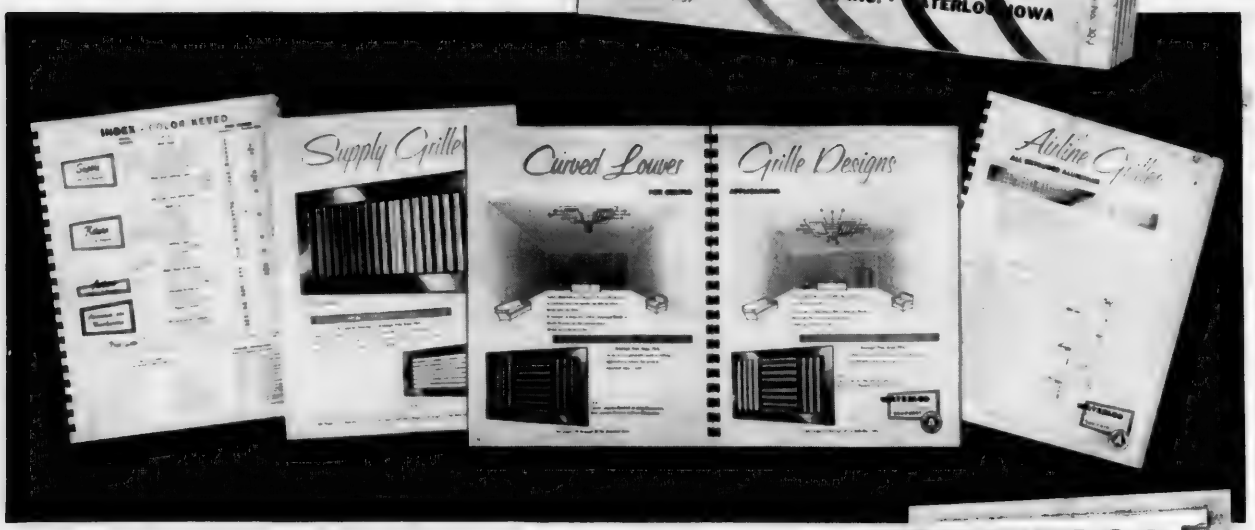
Announcing

NEW WATERLOO Catalog*

- Fully illustrated
- Color keyed for easy reference
- Contains complete data on wide range line of grilles and registers

This new 58-page Catalog gives you information you need on Waterloo's complete line of return and supply registers, extruded aluminum Airline grilles, removable core grilles, volume control dampers and door ventilators. Each type of unit is well illustrated and keyed in color for quick reference. The catalog contains many recent design developments.





* *Write for your free copy of this comprehensive guide to the quality-built Waterloo line.*

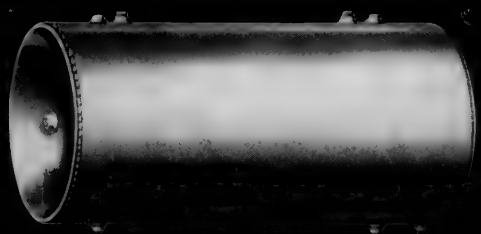
WATERLOO REGISTER COMPANY, INC.

P.O. BOX 72, WATERLOO, IOWA

WATERLOO Air Diffusion EQUIPMENT

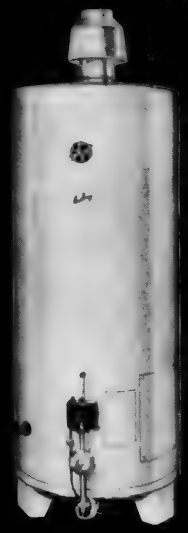
TESTED · APPROVED · INDUSTRIAL CORPORATION OF AMERICA

WR-113



PERMAGLAS GLASS-LINED STORAGE TANKS in sizes up to 6,000 gallons

4 BURKAY COIL-TYPE WATER HEATERS 110,000 to 420,000 BTU per hour



4 BURKAY GLASS-LINED WATER HEATERS 50,000 to 97,000 BTU per hour

A.O.Smith Burkay® gas-fired

COMMERCIAL WATER HEATERS FOR EVERY LARGE-VOLUME NEED

From teakettles to high-presure boilers, there are countless ways to heat water.

Of course, there's a lot more to it than that. You're not satisfied unless a system will provide ample hot water (but not too much)—heated to exactly the right temperature—with minimum delay—at lowest cost.

Add the vital consideration of *long life*, and you have five good reasons for *Burkay*'s undisputed leadership in the commercial water heating field. *Burkay* coil-type heaters offer rust-proof copper construction; *Burkay* storage-type heaters feature the famous A. O. Smith glass lining plus exclusive *Hydrasteel.**

Whichever you choose, you know you're specifying a performance-proven water heater that's built to stand up under the day-to-day punishment imposed by heavy commercial usage.

All models are fully guaranteed by A. O. Smith—approved by the American Gas Association for outlet temperatures of 180°. In addition, *Burkay* coil-type heaters and *Permaglas* glass-lined storage tanks bear the A.S.M.E. seal of approval (optional on storage tanks). Fully approved by C.G.A. and C.S.A. for use in Canada.

Acquaint yourself now with the full line of A. O. Smith water heaters and water heating systems. Complete application data is yours for the asking.

*Patents Pending

5 BURKAY SWIMMING POOL HEATERS 110,000 to 420,000 BTU per hour

... Send today for complete application data!

A. O. SMITH CORPORATION
Permaglas Division, Dept. AAV-559
Kankakee, Illinois

Gentlemen:
Please send me a copy of the *Burkay* Architect's Manual, including product specifications, sizing information and installation instructions for *Burkay* commercial water heating equipment.

Name.....

Firm.....

Type of Organization.....

Address.....

City.....Zone.....State.....

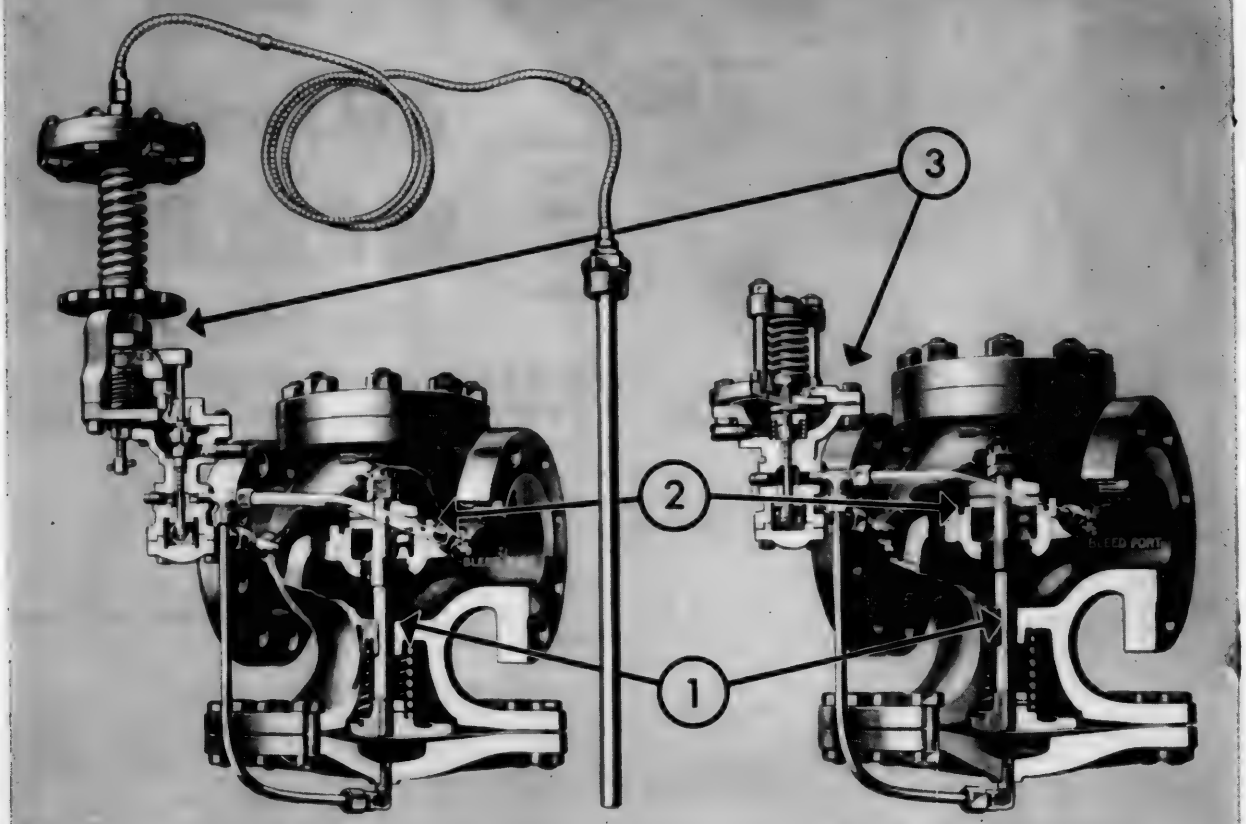
Through research ...in better ways

A.O.Smith CORPORATION

PERMAGLAS DIVISION, KANKAKEE, ILLINOIS
A. O. Smith International S. A., Milwaukee 1, Wis.

makers of famous Permaglas glass-lined water heaters... Permaglas heating and cooling

3 Tips for Low Maintenance in Automatic Regulating Valves



Spence ET124 Temperature Regulator

Spence ED Pressure Regulator

No engineer has to be told that downtime of regulating valves is costly—and a nuisance.

Nowadays the men who keep these valves operating want to make sure they aren't stuck with a maintenance headache for the life of their valves. That's why we are outlining this simple check list which covers three important features which keep maintenance costs down.

1. Stuffing boxes are probably the number one time consumer in valve maintenance. No matter how you figure it, repacking stuffing boxes is costly.

That's one reason Spence uses a "balanced" diaphragm construction which eliminates stuffing boxes. Simple stem guiding and large metal diaphragm operation reduce sticking and binding to a minimum.

2. Another problem is replacement of seats and discs when they've been cut by steam. Today you can forget about this problem entirely by insisting on an unconditional guarantee against wiredrawing. Spence, for instance, uses SECO Metal seats and discs and gives such a guarantee.

3. Any valve designed to control temperature and pressure within tight limits can be affected by dirt in the steam lines. You can't get a guarantee against this, but you can specify a valve that makes trouble shooting easy. Here's the tip:

Make sure your regulating valve is controlled by an external pilot. If trouble develops, it is easy to find out if it is in the pilot or the main valve with a simple test.

If the trouble is in the pilot, you can remove it without taking the main valve out of the line.

The quickest way to get the regulator working again is to install a spare pilot. This is easy—and in the Spence design it is not expensive to carry spare pilots. Spence pilots fit all sizes of Spence main valves.

These maintenance advantages plus other advanced features are available in a wide range of Spence automatic regulating valves. For more information write for the Bulletin TE.

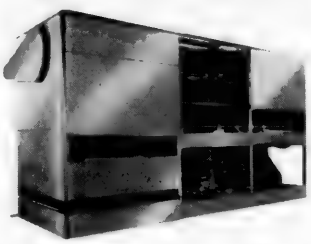
SPENCE ENGINEERING COMPANY, INC.
Walden, New York

SE-144

CITIES SERVICE OIL COMPANY — ROMA WINE COMPANY — ALLEN B. DUMONT LABORATORIES, INC. — AMERICAN AIRLINES, INC. — GENERAL SERVICES ADMINISTRATION — J. M. FIELDS STORES — U. S. ARMY — FROZEN RITE, INC. — PACIFIC TELEPHONE & TELEGRAPH COMPANY — TEXAS FASTENER CORPORATION — RONEY PLAZA HOTEL — UNIVERSITY OF SOUTHERN CALIFORNIA — PHILLIPS PETROLEUM COMPANY — CHICAGO BRIDGE & IRON — GENERAL ELECTRIC — ATLANTIC & PACIFIC TEA COMPANY — ROBERT HALL CLOTHIERS — HUMBLE OIL COMPANY — OLIN MATHEISON — LOCKHEED AIRCRAFT AREOJET — SYLVANIA ELECTRIC — F. W. WOOLWORTH COMPANY — KAISER ENGINEERING CORPORATION — U.S. NAVY SAFEWAY STORES — CONVAIR — ATOMIC ENERGY COMMISSION — CONTINENTAL BAKING COMPANY — REPUBLIC AVIATION — FOOD FAIR STORES — NATIONAL CASH REGISTER — BURROUGHS CORPORATION — FEDERAL HOUSING ADMINISTRATION — EDISON COMPANY — RAND McNALLY & COMPANY — MINNESOTA MINING & MANUFACTURING BANK OF AMERICA — U.S. AIR FORCE — NEW YORK — FRANKLIN STORES — NATIONAL FOOD STORES — CENTRAL CASUALTY INSURANCE COMPA — C COMPANY — PACIFIC GAS & ELECTRIC — RADIO CORPORATION OF A — KY LAGER BREWING GENERAL — T STORES SEARS & — STATE FARM INS — MUZAK CORPORA — PORATION BOND STO — NSURANCE COMPANY — REFINING COMPANY — COMPANY NEW ENGLAND TELEP — LONIAL STORES, INC. GLENN MANUFACTURING COMPANY — CURTIS WR — EL MUNDO, INC. — U. S. PLYWOOD — FORD MOTOR COMPANY OF CANADA, LTD. — DIPLOMAT HOT — ILD CAMERA & INSTRUMENT COMPANY — AMERICAN THERMOS PRODUCTS — PACIFIC MURPHY MANUFACTURING CORPORATION — THE MAYTAG COMPANY — INTERNATIONAL BUSINESS MACHINES — NATIONAL BISCUIT COMPANY — ASIATIC PETROLEUM CORPORATION — INSULAR CHEMICAL COMPANY STANDARD LIFE & ACCIDENT COMPANY — EASTMAN KODAK COMPANY — UNIVERSITY OF OKLAHOMA — BELL AIRCRAFT MONARCH METALS WEATHERSTRIP COMPANY — McDONNELL AIRCRAFT CORPORATION — BETHLEHEM STEEL COMPANY — B-THRIFTY STORES, INC. — WAYNE PUMP COMPANY — ARMA CORPORATION — THREAD, INC. — AMERICAN OIL COMPANY TRANSCON FREIGHT LINES — AMERICAN CAN COMPANY — KANSAS CITY FIRE AND MARINE INSURANCE COMPANY — T G & Y STORES — BRITISH OVERSEAS AIRWAYS CORPORATION — RAND McNALLY & COMPANY — NEW YORK TELEPHONE COMPANY WESTERN ELECTRIC COMANY — AMERICAN MACHINE & FOUNDRY — W. T. GRANT COMPANY — PIGGLY-WIGGLY FOOD STORES J. C. PENNEY COMPANY — PENN FRUIT STORES — RUTGERS UNIVERSITY — U. S. MARINE CORPS — HOWARD JOHNSON'S KROGER COMPANY — CIVIL AERONAUTICS ADMINISTRATION — E. I. DuPONT De NEMOURS & COMPANY — SAHARA HOTEL

GOVERNAIR

GOVERNAIR PRODUCTS ARE NOW IN USE BY THESE DISTINGUISHED ORGANIZATIONS



Model SCMZ

Self-contained Multi-Zone air conditioner — one of 18 basic Self Contained equipment models, available from 3 to 120 tons.

Model GMZ

Governair also "Satisfabricates" a complete line of Vertical, Horizontal and Multi-Zone Air Handling Units.

"SATISFABRICATED"©

. . . that's the copyrighted term that describes Governair air conditioning . . . equipment which is so basically flexible in design, that it can be manufactured to fit almost *any* space and load requirement.

This beneficial feature, pioneered and developed by Governair, is coupled with imaginative, tested engineering and quality workmanship. The end result is an installation that's a much *wiser* dollar investment.

Write for detailed information, or consult your yellow page directory for the name of our local representative.

THE GOVERNAIR CORPORATION

4840 N. SEWELL • OKLAHOMA CITY

To the man who asks: "What's in it for me?"

You've probably read . . . or heard . . . about the Seal of Certification Program for unitary* air-conditioners. You probably know that it was developed by the Air-Conditioning and Refrigeration Institute in cooperation with the National Warm Air Heating and Air Conditioning Association.

"All right," you say. "So what's in it for me?"

Good question. And it has some good answers. For instance:

YOU CAN NOW SPECIFY WITH ASSURANCE, because this program takes the guesswork out of a complete system. Of course, it's still up to you to determine the total cooling capacity needed, but now you'll be working with units of *assured* capacity.

YOUR SERVICE CALLS AND EXPENSES SHOULD BE REDUCED. You'll eliminate many headaches caused by units which do not perform satisfactorily under adverse conditions. This is because ARI-certified equipment, in addition to meeting ARI capacity-rating standards, is also subject to a number of rigid performance and safety tests. Among these are tests covering insulation efficiency, condensate disposal and performance under maximum operating conditions. With these additional assurances of *guaranteed* performance, your customers will be happier . . . and so will you.

YOUR SELLING JOB WILL BE EASIER. Too often, a customer decided *not* to buy, because he was confused. He didn't know what to believe among so many conflicting and ambiguous claims about performance. Now, you can present a factual, uncomplicated selling story about units with the Seal of Certification. Customers can readily compare brands by the *same* standard of rating capacity . . . and then decide what other features . . . and price range . . . they want.

That's what's in it for you.

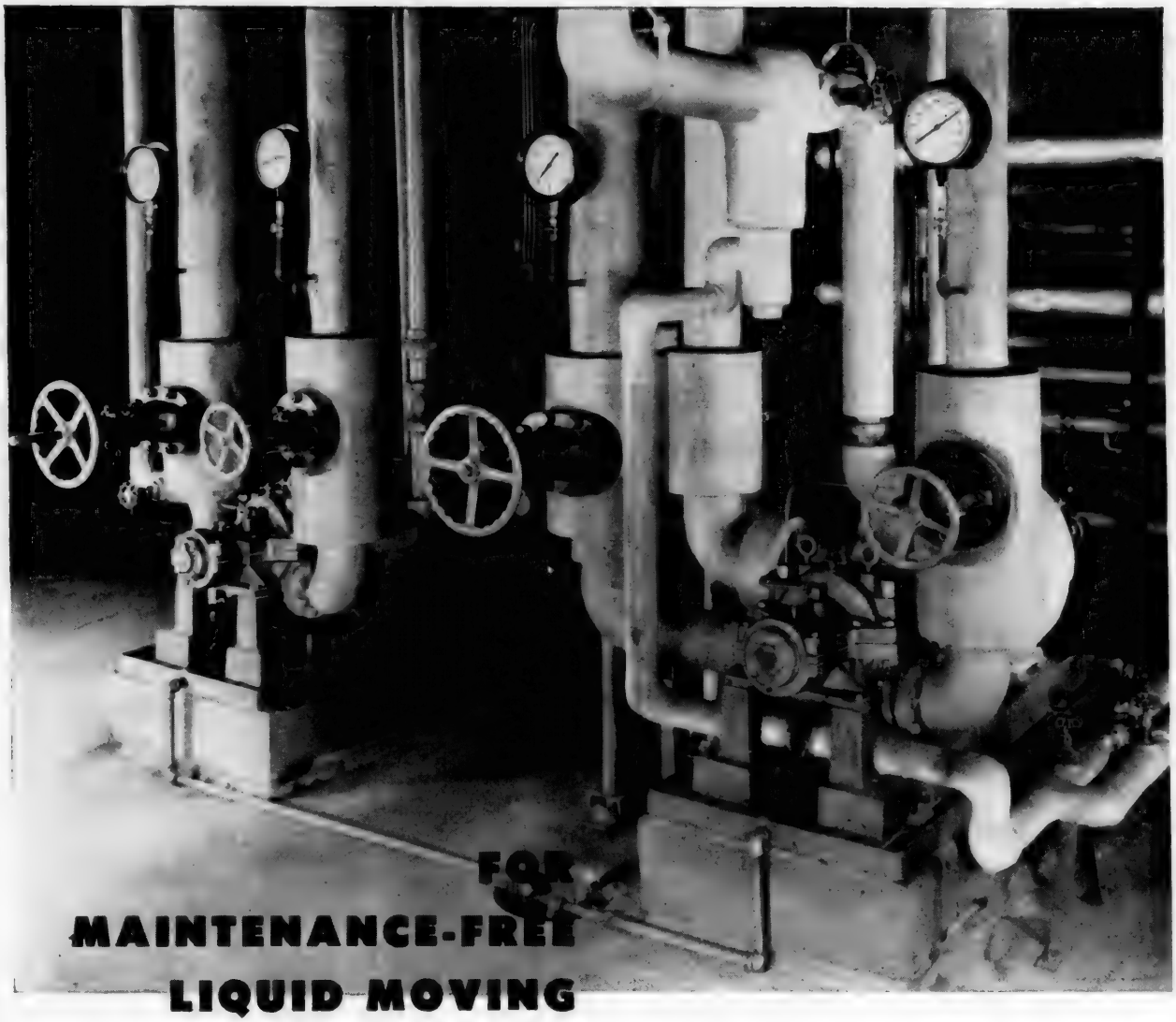
Any more questions? You'll find the complete story of this program in the free ARI explanatory booklet (available also in quantity for your customers). For your copy (and a copy of the Directory of participating manufacturers and their models), write to:

Chief Engineer, Dept. B-5, Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N.W., Washington 6, D. C.

*"Unitary" air-conditioners: all packaged air-conditioners, whether single units or combined units (called "split" systems) up to 135,000 btu in capacity, but not including room air-conditioners or heat pumps.

Manufacturers participating in the program:

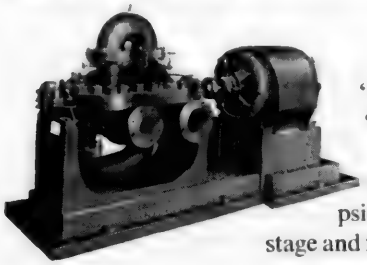
Airtemp Division, Chrysler Corporation • Amana Refrigeration, Incorporated • American Furnace Company • American-Standard Industrial Division, American Radiator and Standard Sanitary Corporation (Formerly American Blower Division) • Arkla Air Conditioning Corporation • Armstrong Furnace Company, Division of National Union Electric Corporation • Bryant Manufacturing Company, Division of Carrier Corporation • Carrier Corporation • Columbia Specialty Company, Incorporated • Continental Manufacturing Company • Coolerator Division, McGraw-Edison Company • Curtis Manufacturing Company • Day and Night Manufacturing Company, Division of Carrier Corporation • Florida Warren Corporation • Fraser and Johnston Company • Friedrich Refrigerators, Inc. • Frigidaire Division, General Motors Corporation • Gaffers & Sattler, Division of Utility Appliance Corporation • General Electric Company • Gibson Refrigerator Company, Division of Hupp Corporation • Grove Furnace, Inc. • Hall-Neal Furnace Company • International Heater Company • Janitrol Heating & Air Conditioning Division, Surface Combustion Corporation • Lennox Industries Inc. • The Majestic Company • The Mathes Company, Division of Glen Alden Corporation • Miami Products, Inc. • Mueller Climatrol, Division of Worthington Corporation • National Thermatic Corporation • National-U.S. Radiator Corporation • The Payne Company, Division of Carrier Corporation • Peerless Corporation • Perfection Industries, Division of Hupp Corporation • Rheem Manufacturing Company • Round Oak Company of Indiana, Incorporated • A. O. Smith Corporation • Southwest Manufacturing Company • Therm-Air Manufacturing Company • The Trane Company • Typhoon Air Conditioning Company, Division of Hupp Corporation • United States Air Conditioning Corporation • Westinghouse Electric Corporation • Worthington Corporation • York Corporation, Subsidiary of Borg-Warner Corporation



FOR MAINTENANCE-FREE LIQUID MOVING

"Buffalo" Class "RR" Pumps

For boiler feed and other high pressure, high temperature applications with clear water, "RR" Pumps deliver the utmost performance with an absolute minimum of maintenance. The unique "Buffalo" Class "RR" design is unsurpassed for consistent hydraulic balance. Rugged "Buffalo" construction features include efficient impellers — extra generous bearings and shafts — rigid casings with simply-formed passages to avoid friction losses — very deep stuffing boxes to accommodate more packing.



"Buffalo" Type "RR" Boiler Feed Pumps for pressures up to 500 psi. Available in two-stage and four-stage models.

These superior "Buffalo" design and construction features assure you of pumps that will stand up under continuous punishing service — that require practically no attention other than lubrication — that deliver more water at less cost for power.

The "Buffalo" Class "RR" Pump is your best buy for clear water service — hot or cold — against heads as high as 1500 feet — at capacities up to 900 gpm. Ask your nearby "Buffalo" engineering representative for full information, or write us for Bulletin 980-D.

"Buffalo" Pumps bring you the famous "Q" Factor — the built-in QUALITY that provides trouble-free satisfaction and long life.

BUFFALO PUMPS

Division of Buffalo Forge Co.

"Buffalo" PUMPS

480 Broadway • Buffalo, N. Y.

Canada Pumps, Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

Part of the University of Kentucky's Cooperstown Project—seven buildings containing 330 apartments for married students

Architect: Brock & Johnson, Lexington, Ky.
Engineer: Stagg & Fisher, Lexington, Ky.
Heating Contractor: George Pridemore & Son, Inc., Lexington, Ky.
Distributor: Plumbers Supply Co., Lexington, Ky.

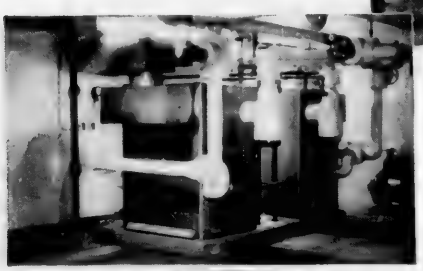
MODERN UNIVERSITY HOUSING HEATED BY 24 WEIL-McLAIN MODERN TYPE "J" GAS BOILERS

For this handsome student housing project and its mate, the five-building Shawneetown Project, University of Kentucky officials selected Weil-McLain Type "J" Cast Iron Gas Boilers. Selection was based on the performance and dependability characteristics of these modern heating units.

A total of twenty-four boilers is installed to heat the buildings of the two projects. The wide range of sizes in which Type "J" Boilers are available permits accurate sizing to any heating requirement.

WEIL-McLAIN TYPE "J" BOILERS OFFER THESE FEATURES FOR ECONOMY, DEPENDABILITY, LONG LIFE:

1. Made of cast iron—corrosion-resistant.
2. AGA approved minimum efficiency of 80%.
3. Develop full capacity as rated by I=B=R.
4. Compact design saves space—up to 40%.
5. AGA approved for all gases.
6. Available with AGA approved dual fuel manifold.
7. Electronic controls available as engineered part of unit.
8. Only a vent required to carry off products of combustion.
9. Lower maintenance—easily cleaned, no refractories, no motors, no fans, no tube replacement, no water treatment.
10. Can be assembled at any stage of building construction. Sections pass through ordinary door.
11. Capacity easily increased by adding sections.



Weil-McLain Type "J" Boilers as installed at University of Kentucky

Send for descriptive literature

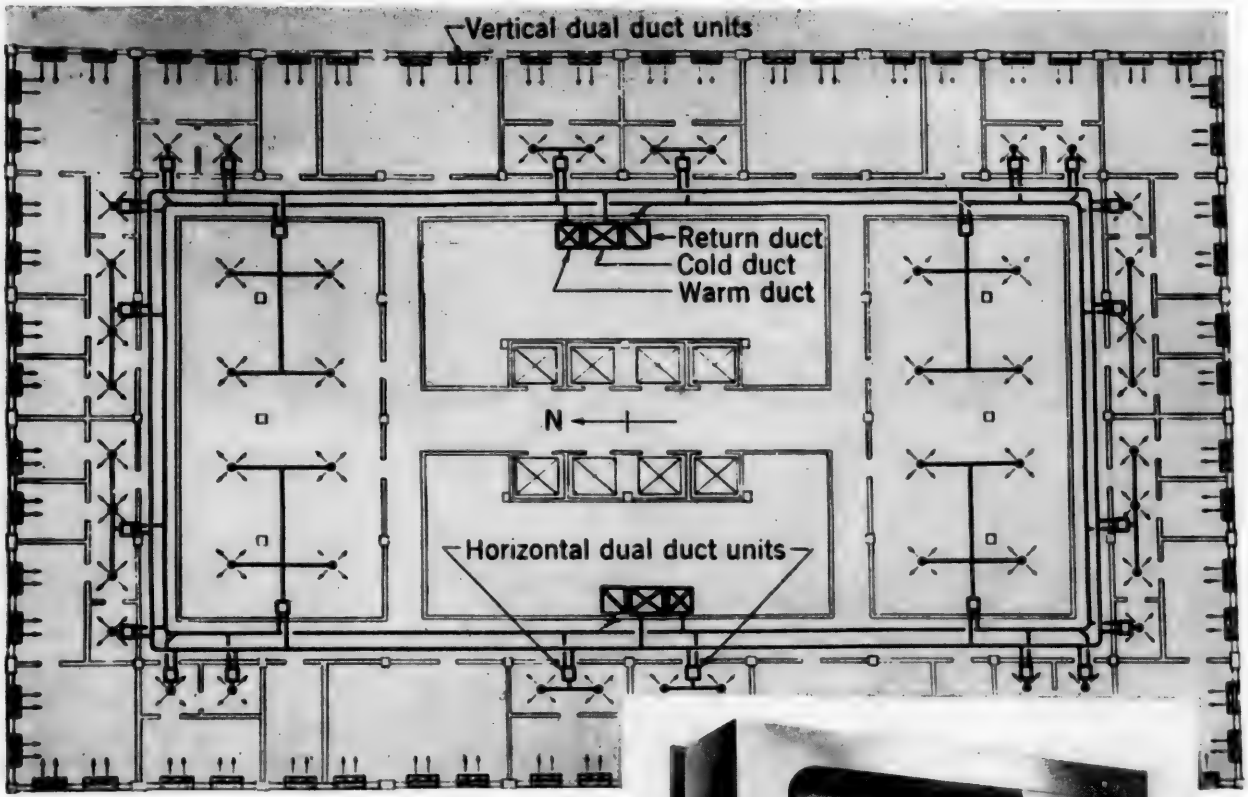
WEIL-McLAIN TYPE "J" CAST IRON GAS BOILERS

WEIL-McLAIN BOILERS · RADIATORS

WEIL-McLAIN COMPANY
MICHIGAN CITY, INDIANA

Address literature requests to Dept. BB-59.

HOW TO "BALANCE A BUILDING" BEFORE IT'S BUILT:



Shown above is a typical office building dual duct layout, 100 per cent air system. It is zoned to provide selective temperature control for each enclosure with Buensod vertical dual duct units at exterior walls. These under-window units may be connected to vertical risers, or to horizontal mains at the ceiling or on the floor below.

Illustrated: Buensod Type V window-wall unit with cut-away showing automatic volume control. This unit is designed for installation under windows to discharge vertically upward, quietly and without draft.

Balancing a building before it's built . . . almost an incongruity, yet Buensod does it consistently. Buensod air mixing units can be pre-set at the factory for desired volume and guaranteed within ±5% when installed. Whenever desired, a change in air volume may be made in the field by simple adjustment of one nut. This practically eliminates the tedious job of balancing after installation . . . a chore which can take months.

The secret is in Buensod's proven Automatic Volume Control. A simple tent-like apparatus maintains constant air quantity from each unit regardless of variance of static pressures on either inlet or outlet of mixing valve. This operates automatically . . . independent of any outside power source, sensing instrument or complicated linkage arrangement. The mixing valve is actuated by a local thermostat to provide the desired room temperature.

Buensod units are being designed into a constantly increasing number of new and renovated structures. Consider them for your next project.

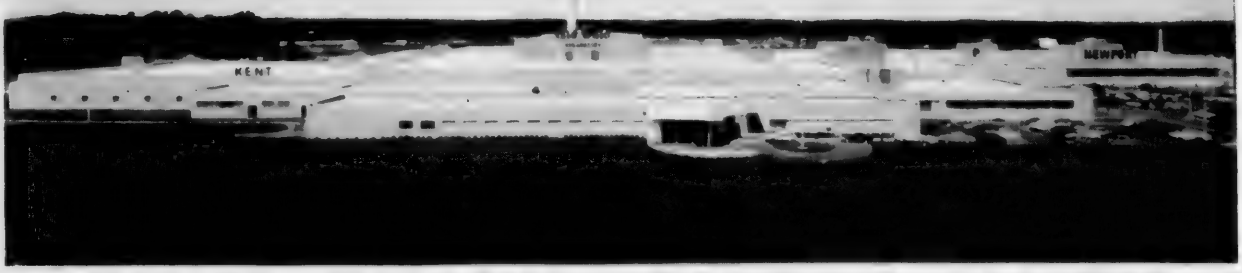
BUENSOD DUAL-DUCT

Write for details to: BUENSOD-STACEY INC. ARLGATE

Buensod-Stacey, Inc., 45 West 18 Street, New York 11, New York

Planning that looked far ahead

P. LORILLARD COMPANY'S
award-winning plant



This plant covering over 600,000 sq. ft. produces famous Old Gold, Kent and Newport cigarettes in a completely automated process. Its most modern "climate control" involves refrigeration capacity equal to 120,000,000 lbs. of ice per year.

Architect and Engineer:
LOCKWOOD GREENE ENGINEERS INC., New York, N. Y.
General Contractor:
H. L. COBLE CONSTRUCTION COMPANY, Greensboro, N. C.
Air-conditioning Contractor:
BUENSOD-STACEY, INC., New York, N. Y.
Piping Contractor:
GRINNELL COMPANY, Charlotte, N. C.
Plumbing Contractor:
DIXON & CHRISTOPHER, INC., Greensboro, N. C.

equipped throughout with JENKINS VALVES

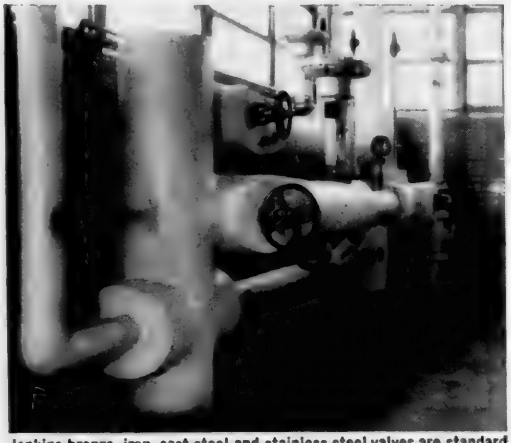
One of the ten "Top Plants of 1956*", the Lorillard plant at Greensboro, N. C. is notable from any standpoint but especially for planning that looked far ahead.

You see it everywhere. In exterior surfaces of brick, aluminum and marble that need almost no maintenance. In walls of glazed tile and floors that are concrete or hard surfaced to reduce cleaning.

You see it in the standardization on Jenkins Valves to assure that costly valve maintenance and replacement will not develop in future years.

To plant and building owners and the experienced men who design and construct for them, the specification "JENKINS" has been an unquestionable assurance for almost a century. You will want to have this assurance of long, trouble-free service when you specify or install valves, especially since Jenkins Valves cost no more. Jenkins Bros., 100 Park Ave., New York 17.

Sold Through Leading Distributors Everywhere



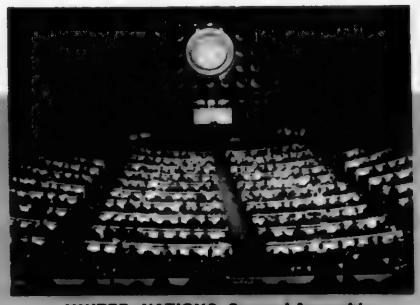
Jenkins bronze, iron, cast steel and stainless steel valves are standard in this modern plant. Shown is a typical installation on the main water supply line.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
JENKINS SINCE 1864
Jenkins Bros

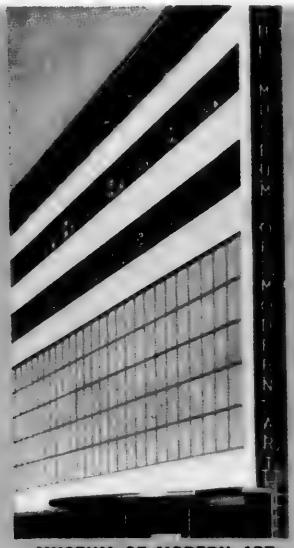
**As selected by a leading business publication*

Prominent New York buildings using POWERS CONTROL

and NOW....

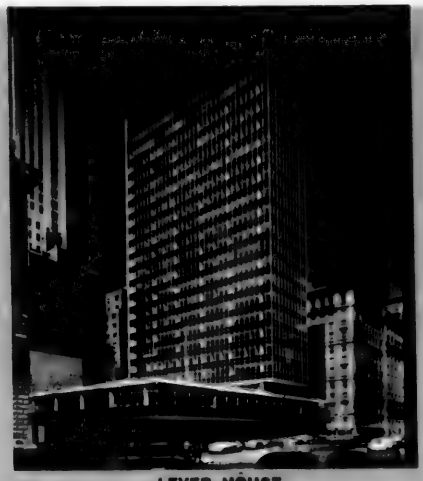


UNITED NATIONS, General Assembly



MUSEUM OF MODERN ART

RADIO CITY MUSIC HALL



LEVER HOUSE

CANADA HOUSE

ROCKEFELLER CENTER, 15 Buildings

NEW YORK COLISEUM

NEW YORK DAILY NEWS

NEW YORK STOCK EXCHANGE

POWERS

Air Conditioning Control

In the World's

100 YEARS OF PROGRESS

EQUITABLE LIFE ASSURANCE SOCIETY of the UNITED STATES

is the third largest life insurance institution. In 1959 it is celebrating its 100th Anniversary by erecting a new 42 story headquarters building 546 feet high.

With 1,700,000 square feet of floor space it will be the world's largest single occupancy private office building. It is adjacent to New York's Rockefeller Center located on Avenue of the Americas between 51st and 52nd Streets.

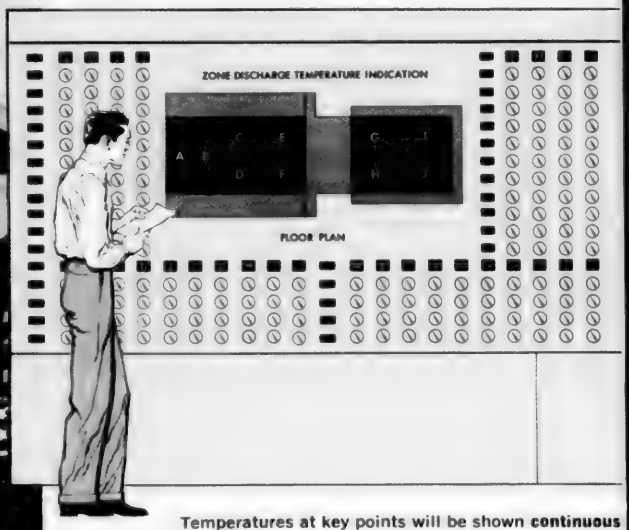
Architects:
SKIDMORE, OWINGS & MERRILL

Mechanical Engineers:
MEYER, STRONG & JONES

General Contractor:
TURNER CONSTRUCTION CO.

Mechanical Contractor:
KERBY SAUNDERS, INC.

Below: Part of the 37 foot long Powers multi-colored control center that will play an important role in efficient supervision and regulation of the 55 air conditioning systems and 19 ventilating units



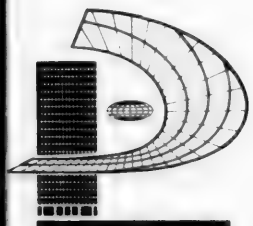
Temperatures at key points will be shown **continuous** by easy-to-read **pneumatic** temperature gages.

NEW EQUITABLE LIFE ASSURANCE SOCIETY BUILDING
NEW YORK CITY

Largest Single Occupancy Tower

POWERS CONTROL

will regulate the Climate of Progress



Air Conditioning Control

• Proper Thermal Environment for 10,000 employees in its new $58,000,000 headquarters building is important for Equitable's continued growth and progress.

Year 'round air conditioned comfort assured by a Powers Quality System of Temperature Control will help provide the climate conducive to better thinking, better planning and increased productivity of employees.

Around 75 Million cubic feet of conditioned air per hour will be circulated through 55 central systems. 5400 Tons of refrigeration will be provided by 4 centrifugal steam turbine driven compressors.

Perimeter areas will be equipped with 5772 induction type air conditioning units, supplied by 12 air conditioning systems. Powers Heating-Cooling Thermostats controlling PACKLESS Valves will enable occupants of each space to select the temperature desired. Interior areas with moveable partitions to permit rearrangement of rooms if required, will have zone controlled air conditioning supplied by 43 central systems.

5772 Induction type Air Conditioning Units

Powers Series 200 Temperature Regulators and Submaster Regulators will be used for precision control of all air conditioning.

POWERS Graph-O-Matic Control Center, 37 feet long, will provide the nerve center for all temperature, humidity and ventilation control systems. Temperatures throughout all the systems are pneumatically transmitted to this center, and the operator is provided with adequate means for re-setting the control instruments located hundreds of feet away.

In Your New Building – make sure you get the maximum return on the investment in air conditioning. Ask your architect or consulting engineer to include a time proven Powers Pneumatic Air Conditioning Control System.

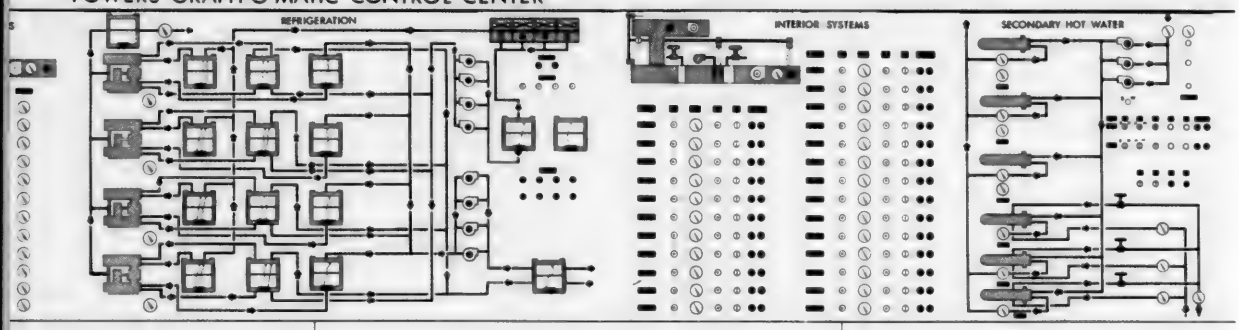
Powers Complete Responsibility for a correctly engineered control system, proper installation, successful operation and SERVICE when required, are your best insurance for dependable year after year performance.

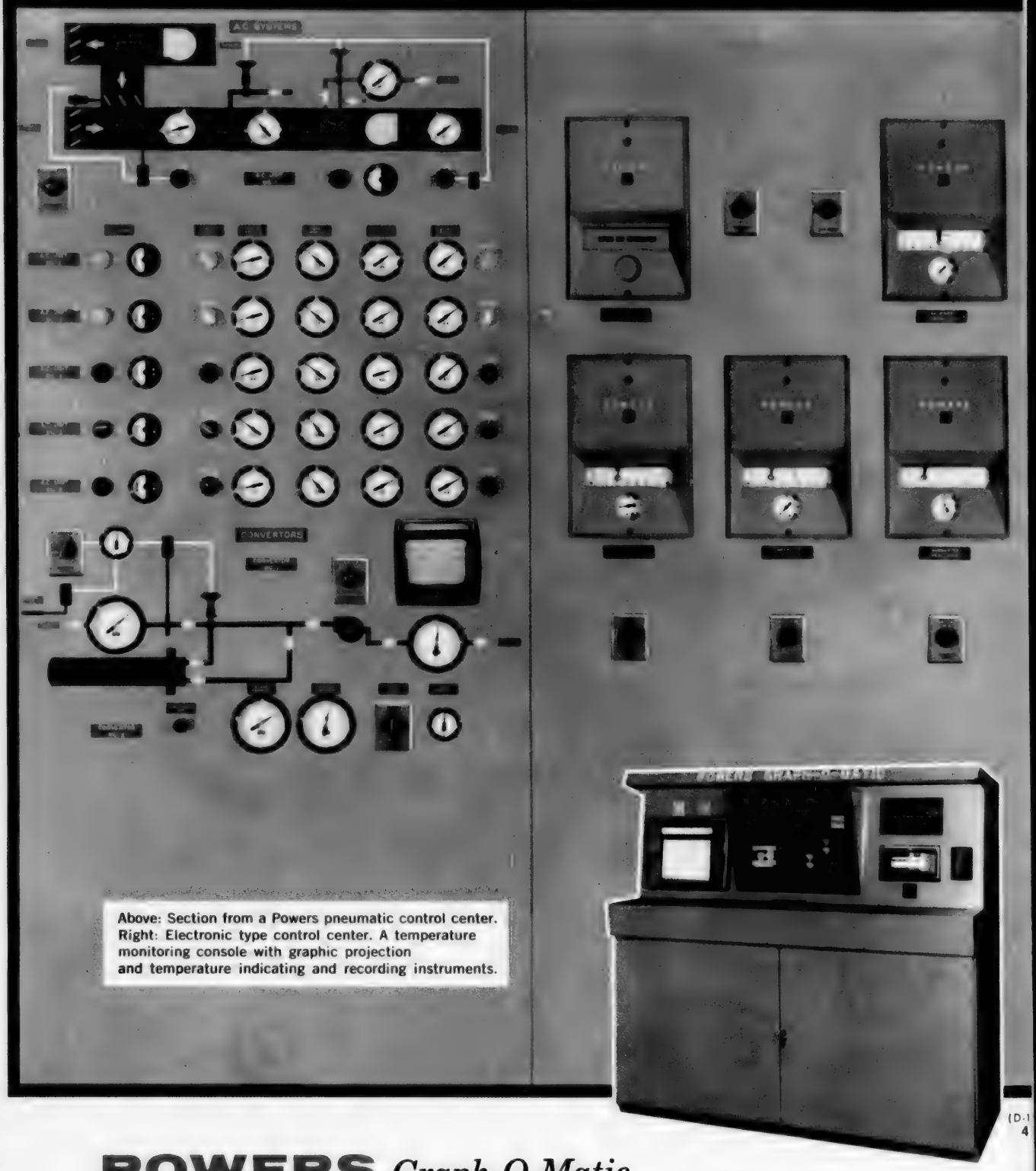
THE POWERS REGULATOR COMPANY

Established 1891 • Factory & General Office, Skokie, Ill. • Offices in 85 Cities in U.S. and Canada

10)

POWERS GRAPH-O-MATIC CONTROL CENTER





Above: Section from a Powers pneumatic control center.
Right: Electronic type control center. A temperature monitoring console with graphic projection and temperature indicating and recording instruments.

(D-1
4

POWERS *Graph-O-Matic*

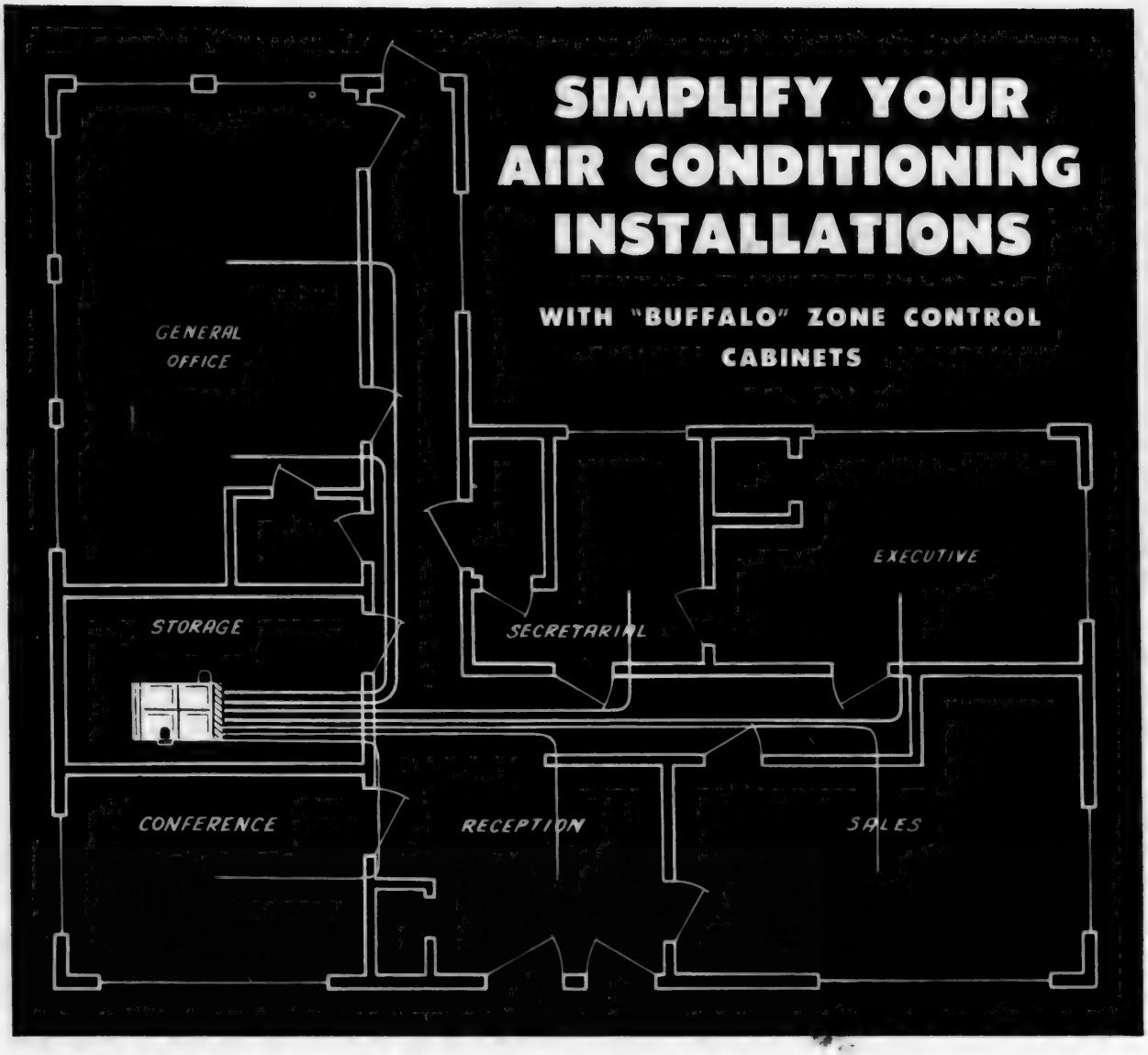
Control Centers

combined with a Powers Quality System of Temperature, Humidity and Ventilation Control, provide the ultimate in indoor climate or process automation. • Graphic panels are custom designed to meet the requirements of each installation. Instruments on pneumatic control panels perform many functions. Temperatures at key points throughout a building are indicated continuously and permit engineer to start, stop, supervise and regulate all equipment without leaving the panel.

Powers Air Conditioning Control Systems Regulate the Climate of Progress

SIMPLIFY YOUR AIR CONDITIONING INSTALLATIONS

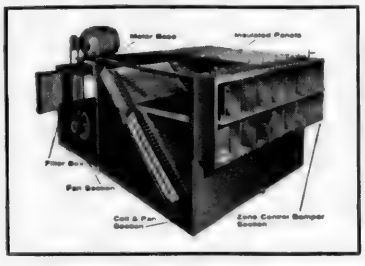
WITH "BUFFALO" ZONE CONTROL CABINETS



These quiet, compact, highly-efficient units are designed for installations where it is most feasible to use a single unit to provide varying degrees of conditioned air for several zones.

- Easy to assemble and install — shipped with sectionalized units, including fan and coil sections, zone dampers and optional accessories.
- Dependable, maintenance-free operation — heavy-gauge, corrosion-resistant construction insures long, satisfactory life on the job.
- Convenient to service — handy access doors, removable panels and outside-located bearings simplify servicing needs.
- Flexible — many combinations available — optional floor or ceiling mounting clips available; can be adapted to any combination of heating, cooling and/or dehumidifying.
- Space-saving design — unique coil angle permits maximum coil face area within minimum headroom and length.

Investigate the many advantages of "Buffalo" Zone Control Cabinets. Call your "Buffalo" engineering representative, or write for Bulletin AC-220.
"Buffalo" brings you "Q" Factor value — the built-in QUALITY that provides trouble-free satisfaction and long life.



Individual Year 'Round Comfort for all with this one compact unit! Temperature is controlled by mixing cooled and heated air in correct proportions to suit each conditioned space. No need for separate re-heat coils and their controls. Control for each area can be manual or completely automatic.

BUFFALO FORGE COMPANY
Buffalo, N. Y.
Buffalo Pumps Division, Buffalo, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo"

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

Perfect air diffusion for electronic computers with ANEMOSTAT AIR DIFFUSERS

High heat return from computer equipment and from high intensity lighting is efficiently controlled by air diffused through scientifically designed Anemostat Air Diffusers.

Anemostat Air Diffusers change the air in a room *once every minute* without a draft. As a result, equipment and technicians operate at peak efficiency in this comfortable thermal environment.

Write for your copy of ANEMOSTAT Selection Manual 60 which contains data on the wide-range ANEMOSTAT line.

ANEMOSTAT®

DRAFTLESS *Aspirating* AIR DIFFUSERS

ANEMOSTAT CORPORATION OF AMERICA

10 East 39th Street, New York 16, N. Y.

Representatives in Principal Cities

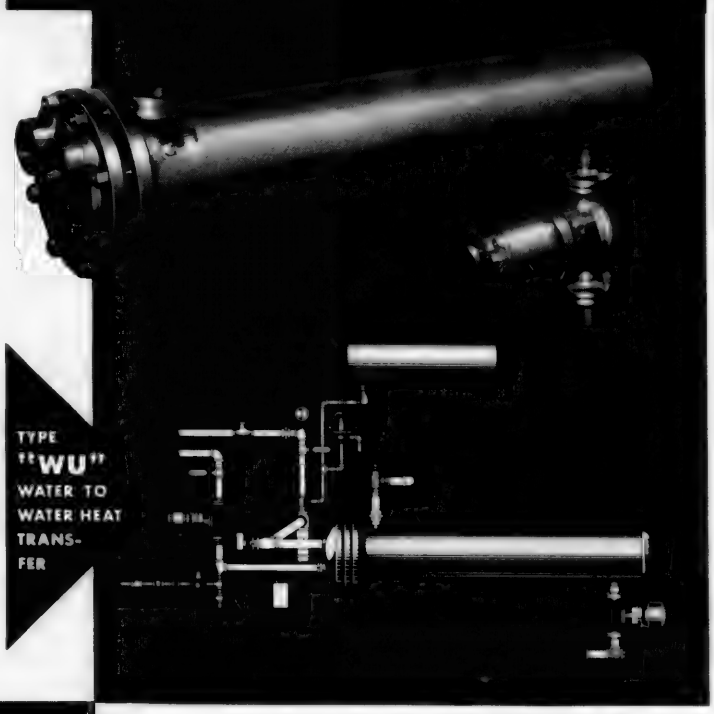
A.S.M.E. CODE

When you install a B&G Heat Exchanger, you have assured yourself of not only high efficiency, but highest quality construction.

With each B&G Exchanger, a Manufacturer's Data Report for Unfired Pressure Vessels, Form No. U-1, as required by the provision of the A.S.M.E. Code rules, is furnished. This form is signed by a qualified inspector, holding a National Board Commission, certifying that construction conforms to the latest A.S.M.E. Code for unfired pressure vessels. The A.S.M.E. "U" symbol is stamped on each exchanger.

Heat Exchangers

FOR RADIATION AND WATER HEATING

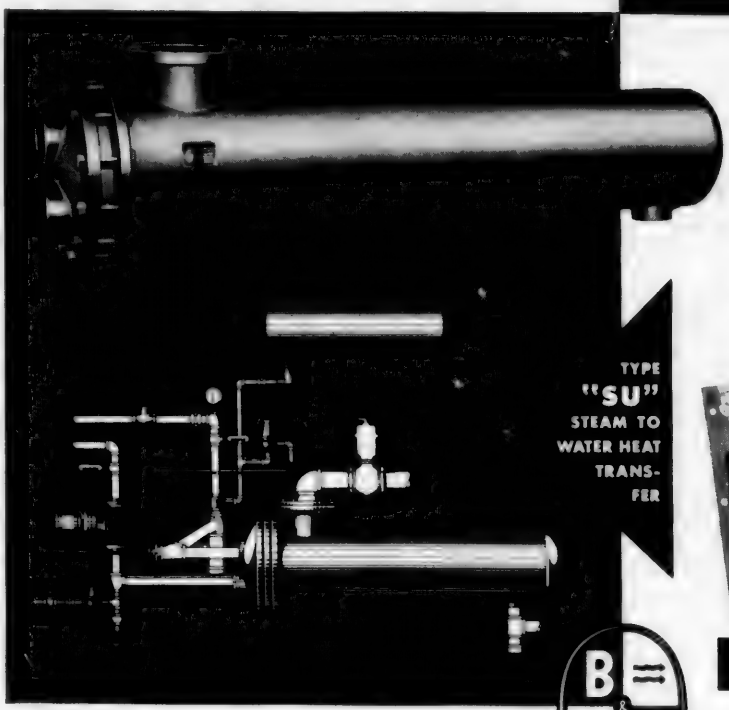


TYPE "WU" WATER TO WATER HEAT TRANSFER

TYPE "WU"

The "WU" Exchanger is equipped with a B&G Booster which pumps boiler water through the shell, greatly increasing the capacity of the unit. An unbelievably small "WU" produces large volumes of hot water. Water temperature is closely controlled... the Booster starts whenever the water goes below the desired degree and continues to run until the water is again at the proper temperature.

When used as a service water heater, a storage tank can be eliminated, because the "WU" heats water as rapidly as it is used.



TYPE "SU" STEAM TO WATER HEAT TRANSFER

TYPE "SU"

In buildings where steam is required for process use, the advantages of a forced hot water heating system can be obtained by installing an "SU" Exchanger instead of an extra boiler.

This exchanger also provides an efficient, low cost method of heating water for apartments, hotels, hospitals, industrial and processing plants. No storage tank is needed.

For complete information send for "WU" Catalog No. GC-1054 and "SU" Catalogs No. SC-159 and SI-159.

*Reg. U. S. Pat. Off.

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Dept. FS-4, Morton Grove, Illinois

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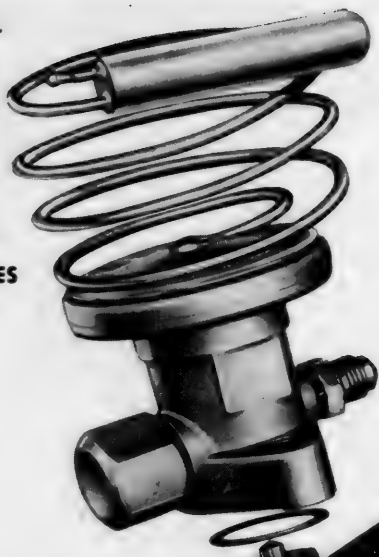
•THERMO EXPANSION VALVES

REFRIGERANT
FREON-12
FROM ½ TON TO 50 TONS
REFRIGERANT
FREON-22
FROM 1 TON TO 80 TONS
CARRENE-7
FROM ¾ TON TO 60 TONS
PROPANE
FROM 1 TON TO 88 TONS



to change capacity... or to clean

Simply . . . loosen screws lift out cage... you never break connections

2 body designs meet every requirement . . .

STRAIGHT-THROUGH CONNECTIONS or RIGHT ANGLE CONNECTIONS

Call your Alco wholesaler.
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• *BUY QUALITY*
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7802

The one complete line of refrigerant controls: Thermostatic Expansion Valves • Refrigerant Distributors Solenoid Valves • Suction Line Regulators • Flooded Evaporator Controls and Reversing Valves

Unsurpassed Mechanical and Electrical Life

NEW complete line of low voltage motor control

Attractive enclosures of this new line of Size 0 through 4 Allis-Chalmers control *forecast* quality . . . modern engineering design *assures* it . . . performance tests *confirm* it. Millions of "life-test" operations attest to the functional quality in every detail — assure the ultimate in dependable performance and sure protection for personnel, motors and machines.

Contact block of glass-filled thermal-setting molding. Contacts of cadmium silver oxide, contact carrier of metal-reinforced molding, dual-voltage coils encapsulated in epoxy-resin — these are just a few of the superior materials used to assure maximum operating dependability and long life.

Accessibility — Modern design provides wide-open accessibility for fast and easy installation, modification, inspection and maintenance.

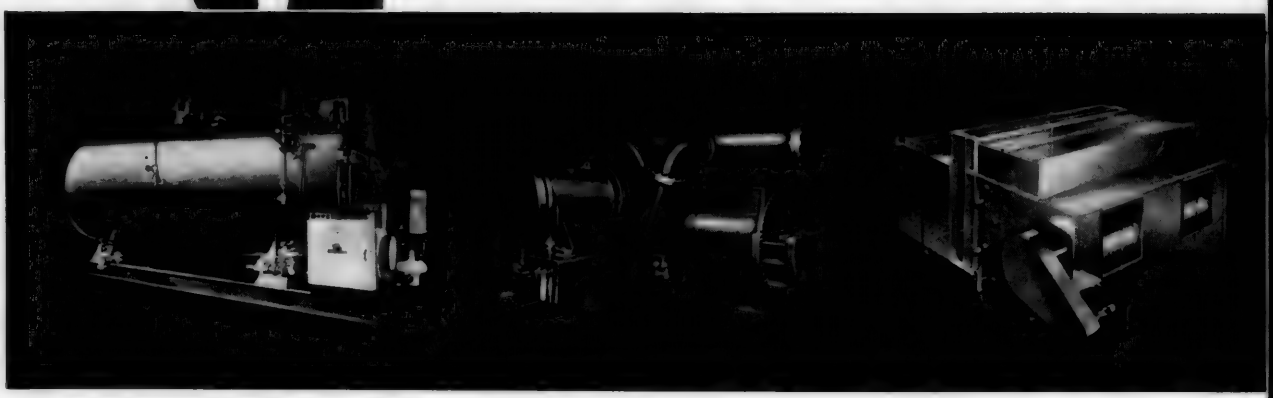
Flexibility — Flexible design permits making many modifications in the field with ease. Minimum parts requirements facilitate delivery from local stock.

A complete line of low voltage control (Size 0 through 8) and high voltage control *in all NEMA enclosures,* plus engineered control systems. Your A-C distributor or representative will give you all the details. *Or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.*

ALLIS-CHALMERS

A-5986

Calling in equipment on your



Firebox, scotch-type steel boilers and package units for heat, power, steam.

Centrifugal refrigerating machines for central-station air-conditioning systems.

Central-station air-conditioning units for public buildings, industrial plants.

One call for all

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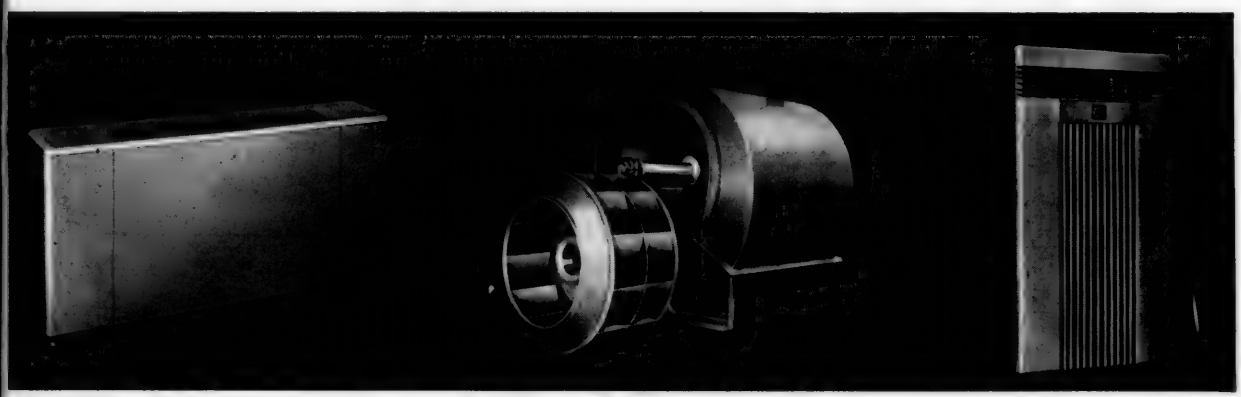
Be sure one of the representatives you call is from

AMERICAN-Standard Industrial Division

You benefit by discussing equipment-selection with an engineer. American-Standard* Industrial Division is engineer-staffed from brass to branches. Combining three American-Standard divisions — American Blower, Ross Heat Exchanger, Kewanee Boiler — this new organization offers *one-source responsibility* for quality and performance in equipment designed, engineered, and manufactured to work together. There are offices in all principal cities to assist you — from the planning stage on. Contact the one nearest you. American-Standard Industrial Division, Detroit 32, Mich. In Canada: American-Standard Products (Canada) Limited, Toronto, Ontario.



Fancoil units for cooling and heating individual rooms in multi-room structures.

Heavy-duty centrifugal fans for high pressure air conditioning or ventilating needs.

Packaged commercial air conditioners, air- or water-cooled types, 3 to 20 tons.

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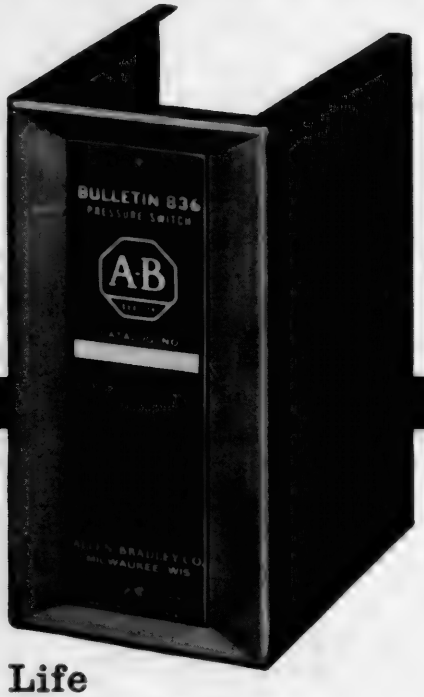
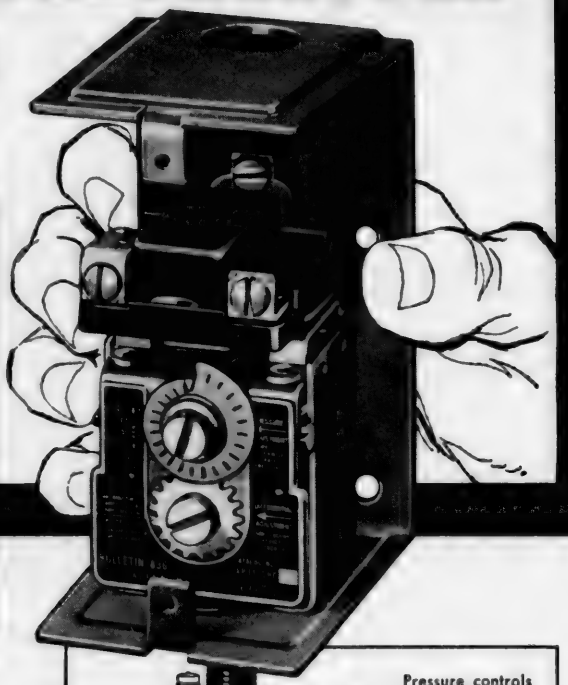
NEW

Allen-Bradley Air Conditioning and Refrigeration

PRESSURE and TEMPERATURE CONTROLS





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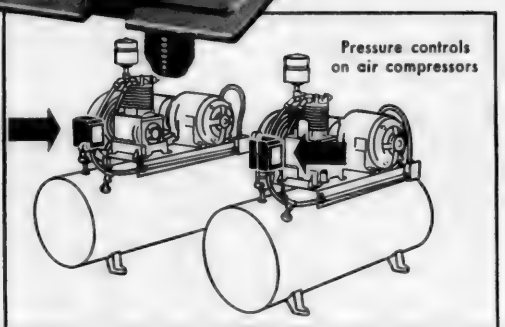
Longer Life
Lower Differentials
Attractive Appearance

Using an improved bellows design, these *new* A-B controls combine exceptionally low differentials with extremely long life — even when cycled from zero to maximum setting. Both the range and differential setting are easily adjustable —and a scale shows the operating point of the control.

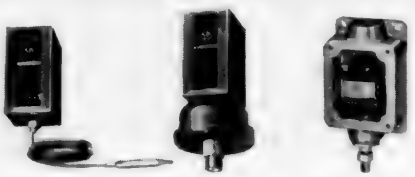
The precision snap-action switch in these controls has no "dead center"—operation is absolutely positive. Vibration or mounting angle cannot cause faulty operation. And the pure silver contacts assure millions of trouble free operations—without maintenance.

For accurate and reliable control of pressure or temperature, you'll find nothing to equal these new controls—they're A-B *quality* throughout. Don't delay — write for details.

Allen-Bradley Co., 1330 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.



Pressure controls on air compressors



Bulletin 837 Temperature Control equipped with capillary tube and bulb.

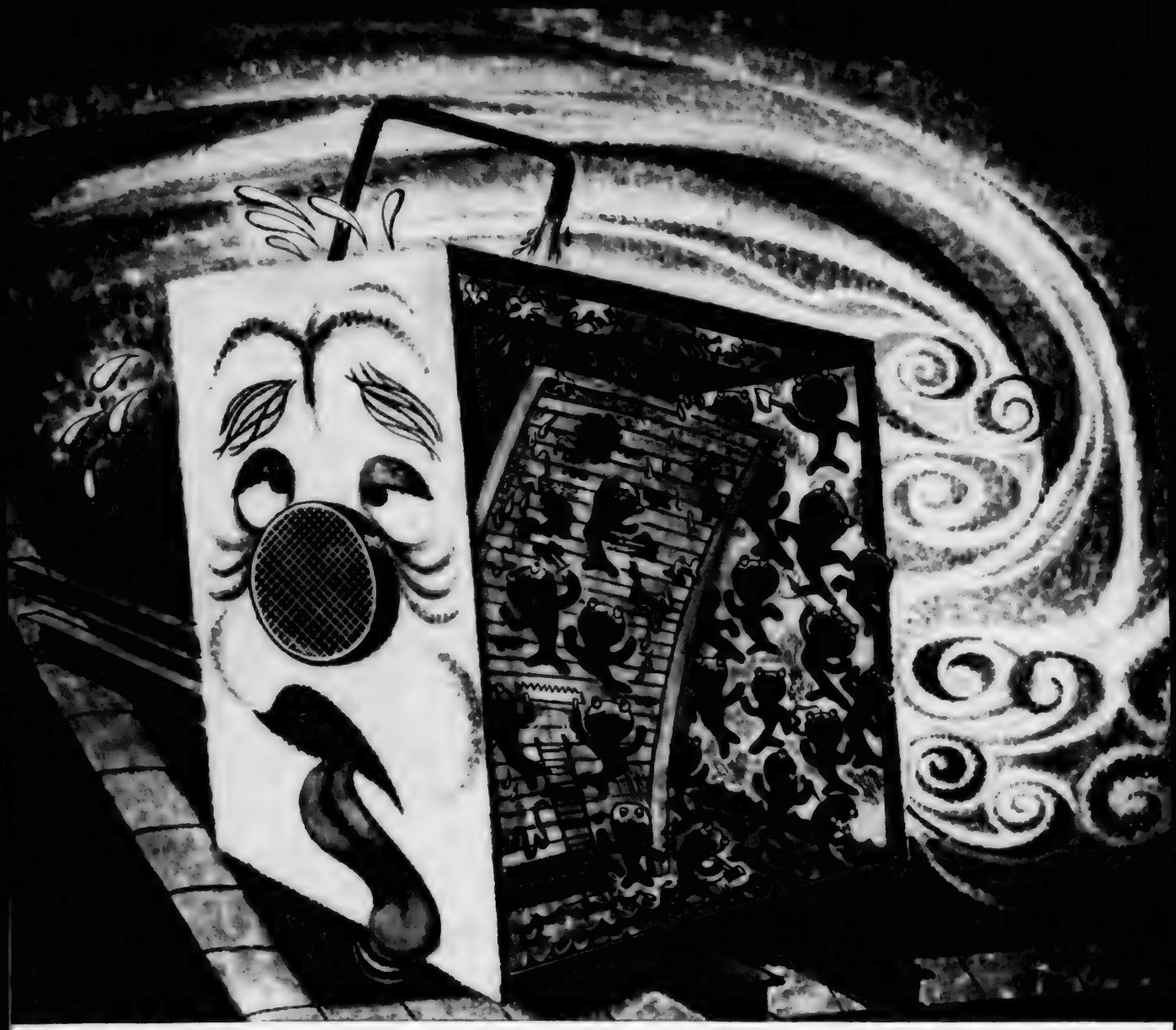
Bulletin 836 Pressure Control for low pressures.

Bulletin 836 Pressure Control in NEMA Type 4 enclosure.

TEMPERATURE RANGES
From −150° F to 490° F

PRESSURE RANGES
From 30" vacuum (Hg) to 900° psi

Quality Motor Control



BEFORE YOU BUY, THINK:

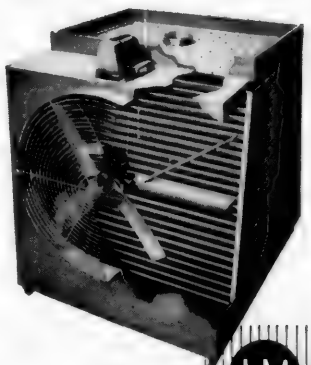
Will fungus attack your cooling tower 2 years from now?

Not if it's a Halstead & Mitchell cooling tower with a 20-Year Guarantee

The specially treated wood decking in H&M towers resists rotting, fungus attack and algae which accumulates and obstructs air flow in most other towers. Performance remains "like new" in H&M cooling towers year after year.

Only Halstead & Mitchell offers a 20-Year Guarantee on the wetted deck against failure due to rotting or fungus attack.

Other H&M features for unusually low maintenance include permanently sealed fan bearings, and a heavy gauge steel cabinet protected against corrosion by three plastic coats applied *after assembly*. Be sure. Ask your local wholesaler for H & M towers, or write to Halstead & Mitchell, Bessemer Building, Pittsburgh 22, Pa.



H & M COOLING TOWER WITH PRESSURE TREATED DECKING

HM Halstead & Mitchell

Water-Cooled Condensers · Cooling Towers · Air-Cooled Condensers · Finned Coil Products

EASIER REMODELING WITH COPPER TUBE. *Overhead work is easier* – no threading, no caulking and a copper tube installation weighs only one fourth as much as one of ferrous piping. *Saves space* – copper tube is trim, solder-joint fittings are compact. *Work is faster* – Anaconda copper tube and fittings for soil, waste and vent lines cut installation time one third to one half. *A better job* – copper tube won't rust: its smooth inside surface resists clogging. For more information and cost comparisons – write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 5804

ANACONDA® **COPPER TUBE AND FITTINGS for soil, waste and vent lines**

Available through plumbing wholesalers. Products of The American Brass Company

Longer Lengths—Few Joints

Preassembly—Saves Time

Lightweight Copper—Easier Installation

Compact Connections—Save Space

Climate by Chrysler

tames Houston's heat at Dresser Electronics Center!

"We'd need 2,400 *tons* of ice—every day—to cool the eight buildings in Dresser Electronics Center*. It takes just *four* Chrysler Centrifugal Units to do the job. And, with Climate by Chrysler, we get many other important benefits, besides.

"Reliability, for example. Chrysler engineering has developed air conditioning equipment designed for years of trouble-free service—and our first year's experience has proved it. Or, take operating costs. They're held to a minimum—thanks to unique engineering features like Chrysler's true volute compressor casing.

"Since our equipment operates winter and summer, safety is vital, too. So each of our Airtemp centrifugal units is complete with automatic purge system, oil and temperature control, and other special protective devices."

Whether your air conditioning job requires 30 tons, or 3,000—it will pay you to get the Chrysler story. Contact your local Chrysler Applied Machinery and Systems sales office. Or write: Airtemp Division, Chrysler Corporation, Dept. I-59, Dayton 1, Ohio.

*New Houston, Texas home of Southwestern Industrial Electronics Co., a Division of Dresser Industries. Shown above: E. L. Andrews, Facility Director for Dresser Industries, Inc. *Consultants:* Bernard Johnson & Associates; Weldon W. Henderson, Consulting Engineer. *Architects:* Pierce & Pierce.

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how the *Peer* is put in *Peerless Electric*®

• Although Peerless Electric makes blowers and fans up to 86″ wheel diameters, smaller units have their place, too. Rigid, final inspection determines whether size, discharge, motor H. P., etc. agree with customers' specifications. Each unit is operated at capacity during this inspection.

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NEW HEATING SYSTEM ...but must conserve capital

Manufacturers engaged in plant expansion or modernization plans must have modern, economical heating system, but must conserve capital for other outlays

here is the answer...

THE DRAVO HEATER LEASE PLAN

Do you need a modern, economical heating system to further plant expansion or modernization plans, but need to conserve working capital? Then the Dravo Heater Lease Plan is made to order for you. Here are the facts:

HOW DOES THE DRAVO HEATER LEASE PLAN WORK?

Your Dravo representative, a qualified heating engineer, works with you or your engineers in setting up the optimum heating plan for your facility. Then, instead of tying up working capital, or waiting to acquire the purchase price, the Dravo Heater Lease Plan goes into effect. You get the low-cost, economical heat you need—*right away*. Dravo offers several alternate methods of spreading the cost over a three to seven year period, each tailored to meet your particular needs, with a renewal option if you wish.

WHAT ARE THE BENEFITS OF THE DRAVO LEASE PLAN?

It frees working capital for other needs that may be more immediately profitable. It actually enlarges your borrowing capacity because the Lease Plan operates independently of your own lines of credit. It allows you to have the heating you need *now*, without the necessity of waiting for more capital.

HOW CAN I GET THE DETAILS OF THE DRAVO LEASE PLAN?

Call your Dravo Heater representative, or use the coupon below.

DRAVO
CORPORATION

DRAVO CORPORATION, Pittsburgh 25, Pennsylvania
Please see that I get full information on the new Dravo Heater Lease Plan.

Name_____ Address_____

Title_____ City_____ Zone_____

Company_____ State_____

LOOK TO LAWLER FOR TOMORROW'S DESIGN IN THERMOSTATIC CONTROLS ..... KNOW-HOW KEEPS US AHEAD!

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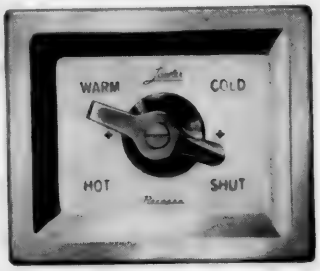

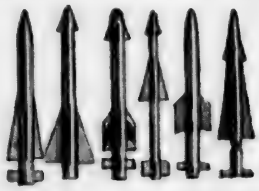

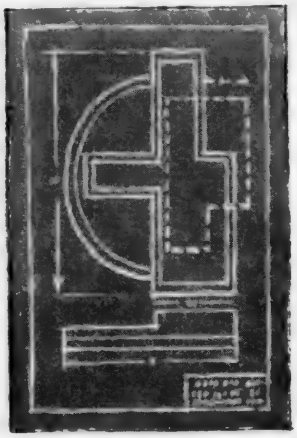

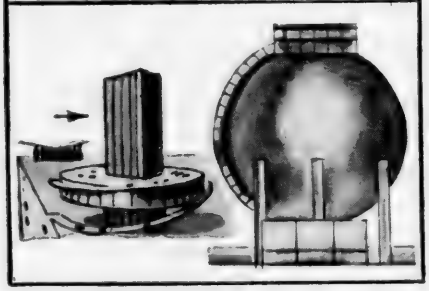

. . . symbol of Lawler's "years ahead" designing that brings you industry's most advanced, consistent thermostatic control.

Lawler engineers have spent the greater part of a half century solving difficult temperature control problems.

In the years to come, Lawler experience and engineering leadership will set the pace in thermostatic control valves.

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LAWLER AUTOMATIC CONTROLS, INC.
Mt. Vernon, N. Y.

...economical G. I. type

PACKAGED INDUSTRIAL FANS

...featuring flat radial blade wheels

A packaged industrial fan is now offered to cope with virtually any industrial air or material handling problem. Weather cover is removable, and motors and drives may be installed, removed, serviced or adjusted on the job by one man. All units are rotatable and reversible in the field. Available in wheel sizes from 14 inch thru 36 inch. Send for Bulletins 585 and 586.

LS TYPE

LM TYPE

For BIG performance

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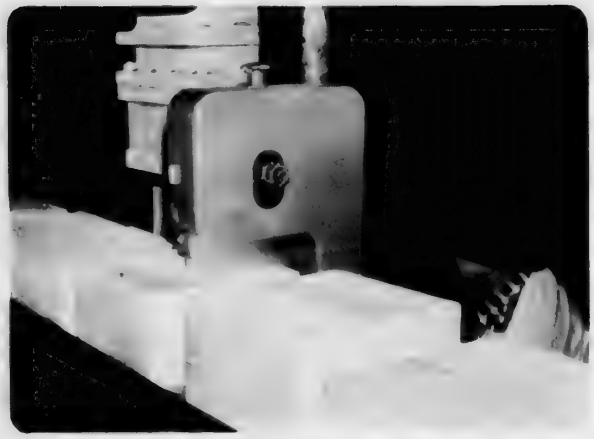
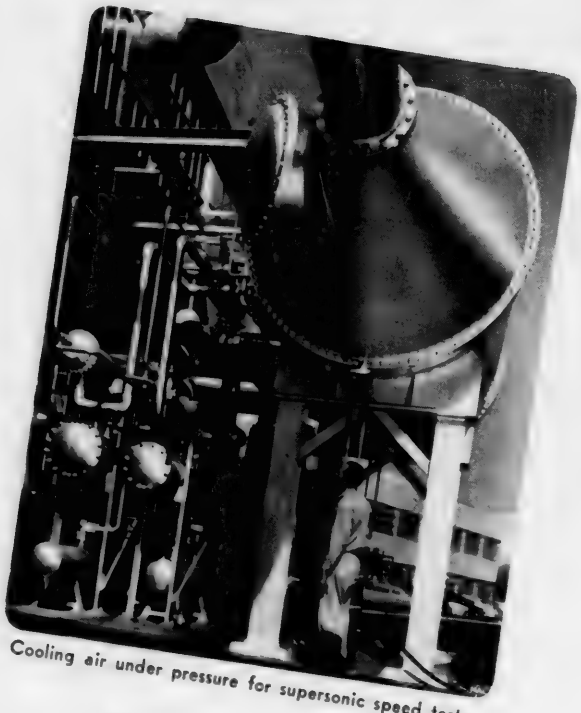
Packaged industrial fans provide LS TYPE wheels as standard, but may be furnished with LM TYPE at slight additional cost. A completely redesigned line of industrial fans is also offered, with wheel sizes from 10 inch thru 78 inch.

THE NEW YORK BLOWER COMPANY

Sales Offices: 3147 South Shields Avenue • Chicago 16



Making dry ice at 109° below zero using standard ammonia compressors in an improved cycle.



Cooling air under pressure for supersonic speed tests.

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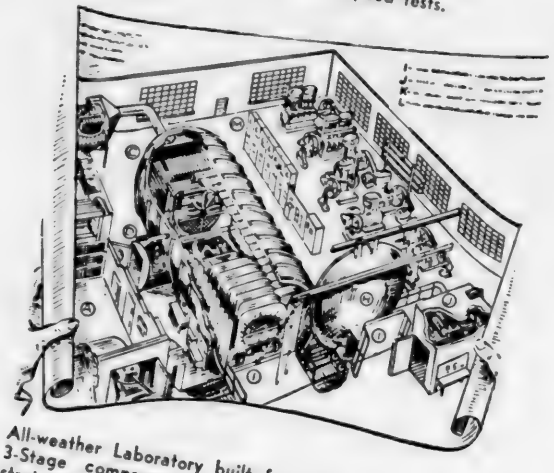
ENGINEERS

WILL DESIGN . . . BUILD *and* INSTALL FRICK SYSTEMS . . .

to solve your most difficult cooling problems.

If you need any type of industrial or commercial cooling—for quick freezing, cold storage, ice making, humidity control, low temperatures, condensing, air conditioning, or any process work—contact the nearest Frick Branch or Distributor for recommendations and estimates.

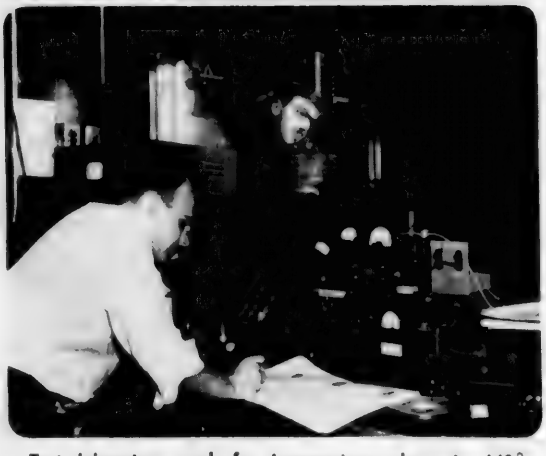


All-weather Laboratory built for U. S. Army. Uses 3-Stage compressors; maintains Arctic, tropic and stratospheric conditions.

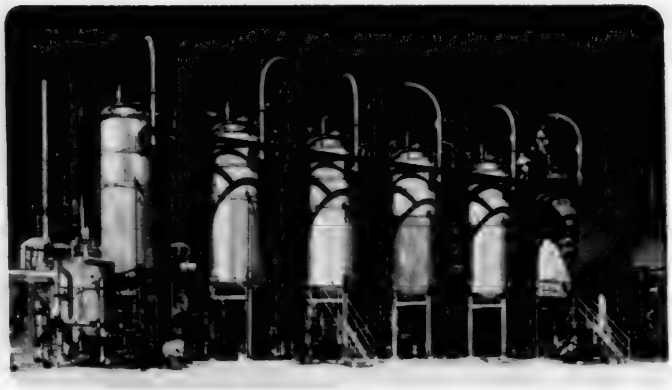
DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO, PENNA., U. S. A.



Test laboratory work for temperatures down to 140° below zero.



Frick patented cooling coils and controls have doubled the output of synthetic rubber reactors.

They compared "K" factors and cost factors ...and bought SNAP*ON®

Here's how <u>you</u> can reduce the cost of insulating large pipe— simply use Snap*On, the original one-piece pipe insulation molded of fine glass fibers. You can use Snap*On in thinner wall thicknesses — *and obtain the same, or superior insulating efficiency* — for Snap*On's thermal efficiency is unique among general-purpose pipe insulations. Application couldn't be easier or more economical — particularly when you use big 6′ one-piece sections that snap on big pipe quicker than you can say "Snap*On!"

Compare these and many other Snap*On advantages by asking your G-B distributor to make a TEVA (Thermo-Economic Value Analysis) survey the next time you plan to insulate piping, be it hot or cold, large or small, indoors or out. Snap*On is available in the *complete* range of sizes from copper tubing to 36″ IPS . . . plain, or with a variety of weatherproof and vapor barrier jackets.

FOR FREE TEVA SURVEY CALL YOUR LOCAL G-B SNAP*ON DISTRIBUTOR

GUSTIN-BACON *Manufacturing Co* GUSTIN gb BACON

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Thermal and acoustical glass fiber insulations • Couplings and fittings for plain and grooved end pipe • Molded glass fiber pipe insulation

Look Inside

YORK'S NEW STEP-BY-STEP AIR CONDITIONING PLAN...

See how York provides the perfect answer to budget-conscious prospects who want air conditioning—but imagine they can't afford it!

York's new zone cooling plan has wide appeal to prospects because of its flexibility and low cost. With it, they can air condition a room at a time, a floor at a time or an entire building, simply by installing York Packaged Units singly or in multiple. That means businesses with limited budgets can air condition the important zones first and add the remainder later. It means installation savings because York Packaged Units may be installed quickly and easily, without tearing down the walls or putting in special foundations. And, it means reduced operating costs because individual units may be turned off when not in use!

Complete Line of YORK Packaged Units Offer The Full Benefits of Air Conditioning!

York's Low Ambient Operation now makes it practical to remove stuffiness, excess heat and humidity in winter as well as summer! Other bonus features include exclusive Cooling Maze Coils that remove 30% more humidity, cool faster...heavy-duty filters that remove dust, dirt and air borne pollens...and gas-cooled, Sealed-in-Steel Compressors that provide longer peak performance!

York Packaged Air Conditioners available in single, double and triple compressor models, air or water-cooled, from 3 through 25 tons.

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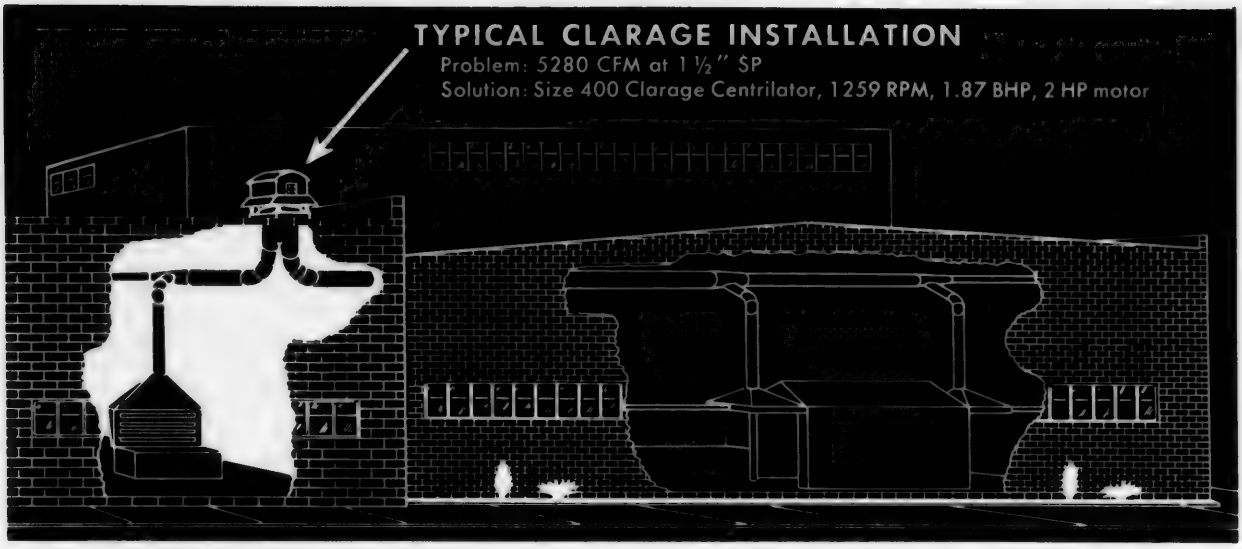
YORK CORP. SUBSIDIARY OF BORG-WARNER CORP., YORK, PA.

Air Conditioning, Heating, Refrigeration and Ice Equipment • Products for Home, Commercial and Industrial Installations


TYPICAL CLARAGE INSTALLATION
Problem: 5280 CFM at 1 ½" SP
Solution: Size 400 Clarage Centrilator, 1259 RPM, 1.87 BHP, 2 HP motor

Demonstrating...

how to save space and money on your next air handling jobs

V-belt driven centrifugal type with backwardly inclined blade wheel. 10 sizes. Capacities from 1,500 to 26,500 CFM. (Shown above with weather enclosure and two sides of air apron removed.)

YOURS...ALL YOURS...with the Clarage Centrilator®* power roof ventilator. Handles static resistances to 2". Requires no floor space. Minimum installation cost. Unequalled accessibility. High efficiency for low operating cost. Ideal solution for numerous industrial systems such as the one shown above.

Get full information on the Clarage Centrilator and its exclusive Jet Siphon tm. Air Flow Director feature. Request Bulletin 550 or contact the nearest of our 58 sales engineering offices today. CLARAGE FAN COMPANY.

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Dependable equipment for making air your servant

CLARAGE

Kalamazoo, Michigan

THIS NEW VACUUM HEATING PUMP

HAS THE INCREASED AIR CAPACITY EFFICIENT HEATING PRACTICE DEMANDS

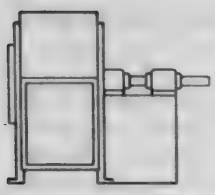
It's the Nash CSM

Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

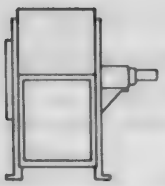
These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

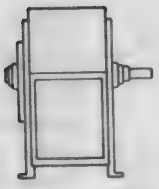
NASH ENGINEERING COMPANY
437 WILSON, SO. NORWALK, CONN.



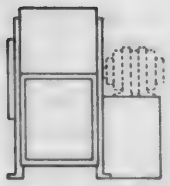
Arrangement No. 1, SW, SI.
For belt drive or direct connection. Wheel overhung. Two bearings on base.



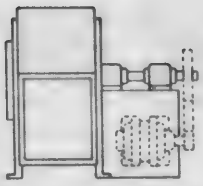
Arrangement No. 2, SW, SI.
For belt drive or direct connection. Wheel overhung. Bearings in bracket supported by fan housing.



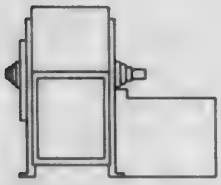
Arrangement No. 3, SW, SI.
For belt drive or direct connection. One bearing on each side and supported by fan housing. Not recommended in sizes 27" diameter wheel and smaller.



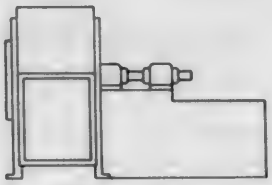
Arrangement No. 4, SW, SI.
For direct drive. Wheel overhung on prime mover shaft. No bearings on fan. Base mounted or an integrally direct connected prime mover.



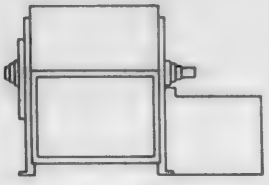
Arrangement No. 9, SW, SI.
For belt drive. Arrangement No. 1 designed for mounting prime mover on side of base.



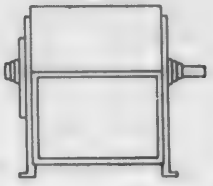
Arrangement No. 7, SW, SI.
For belt drive or direct connection. Arrangement No. 3 plus base for prime mover. Not recommended in sizes 27" diameter and smaller.



Arrangement No. 8, SW, SI.
For belt drive or direct connection. Arrangement No. 1 plus base for prime mover.



Arrangement No. 7, DW, DI.
For belt drive or direct connection. Arrangement No. 3 plus base for prime mover.



Arrangement No. 3, DW, DI.
For belt drive or direct connection. One bearing on each side and supported by fan housing.

Fig. 1. Fan, drive and inlet box arrangements, reprinted by permission of Air Moving and Conditioning Association, Inc. SW indicates single width; DW double width; SI single inlet and DI double inlet.

Corrosion Protection for Fans

A. N. ROGERS

Sturtevant Division, Westinghouse Electric Corp., Hyde Park, Mass.

An application guide for corrosive resistant, gas tight and spark resisting fans. It discusses the various coatings and materials that can be used for fan protection. An extensive table shows the type service that is provided by various corrosion protection means for a large list of air handling products.

THERE are two basic methods of obtaining corrosion protection in air handling products. These methods can be classed as:

1. Use of corrosion resistant metals in the construction of the fan.

2. Use of a protective coating on the exposed surfaces of a standard steel fan.

The protective coating may take the form of a metallic spray, or galvanizing, or an organic compound such as corrosion resistant paint or plastic coating.

Today's technology has produced a wide variety of protective coatings which can offer resistance to most types of corrosive agents found in the handling of gases. In most cases, protective coatings are lower in cost and more readily available than special metals. Where conditions permit, it is advisable to use fans of standard steel construction with a protective coating properly selected and applied.

Corrosion Service

Before a material or coating can be selected to protect a fan against corrosion, it is first necessary to establish the chemical composition of the gas to be handled. Obviously, the exposed surfaces must be resistant to all the components in any specific chemical combination. The concentration, and erosive nature must be considered along with moisture content or possibility of condensation.

The location of the fan may cause condensation if the temperature of the exhaust fumes drops below the dew point.

For simplicity of reference and evaluation, corrosion service for fans may be divided into three categories:

Corrosion Service S (Severe)—This is the most severe service encountered in fan applications involving corrosion resistance. The fan is called upon to handle heavy concentrations of corrosive fumes with possibility of liquid contact due to carryover, splashing or condensa-

tion. This type of service would also apply when solid material is mixed with the gas stream to cause abrasion. Any concentration of highly corrosive agents would also be considered in this Service *S* category.

Corrosion Service M (Moderate)—Most corrosion protection requirements fall into this category. The fan will handle a mixture of fumes and air which dilutes the corrosive element, thus reducing the concentration. There is no direct contact with the actual liquid (acid) or solid (salt), but some moisture may be combined with the fumes.

Corrosion Service L (Light)—Fans handling very dilute gases, or operating in process areas without directly handling the fumes, will fall into the category of Corrosive Service *L*.

Service *L* protection may be provided on the exterior of fans where service *S* or *M* protection is specified for the interior surfaces.

Fan Types for Corrosion Resistant Service

For Service S, centrifugal fans *only* should be used. Bearings should not be mounted in the fan inlets where they would be exposed to the gas stream. Fans should be supplied with flange connections and a drain at the low point of the fan housing. Radial bladed wheels of simple construction are easiest to modify for special metals or coatings and are always preferable when solid material must pass through the fan.

When rubber or neoprene sheet stock lining is required for fans handling large volumes of fumes, airfoil blades offer the dual advantages of low horsepower and ready adaptation for these coverings.

For Service M, either centrifugal fans or properly designed tubeaxial fans with sealed drive and bearing housing may be used. Bearings should not be located in the airstream; flange connections are recommended; centrifugal fans should have drains.

For Service L, standard centrifugal or axial flow fans may be applied, and even light duty fans such as ventilating sets may be suitable.

Fan Arrangements

Service S. Use AMCA arrangements 1, 8 or 9, Fig. 1. *Service M*, use AMCA arrangements 1, 8 or 9. Arrangements 2 or 4 may be used when operating temperatures are normal and the coating weight or rotating elements is not excessive.

Service L. Use AMCA arrangements 1, 2, 4, 8 or 9. AMCA arrangements 3 or 7 (bearing in inlet) may be used for Service *L* provided that shorter bearing life is recognized.

Types of Corrosion Protection

When Service *S* is encountered, the best possible protection is advisable; otherwise the equipment life may be extremely short. Fan construction of corrosion resisting metals may well be justified. Otherwise, heavy duty protection may be obtained with sheet stock rubber linings, or thick plastic coatings.

For Type *M* service, special metals are not normally required. Customary protective coatings on steel will generally suffice.

Type *L* service seldom requires more than a thin protective coating or painting with corrosion resistant paint.

Limitations of Special Metals

Basically, the metal must not only be resistant to the corrosive agents but must also have physical characteristics suited to fan construction. Particularly, it must stand the stresses resulting from the rotation of the wheel. Some materials are difficult to machine or form, particularly certain types of stainless steel. Where the material must be welded, it must be weldable. More important, it must be weldable without impairing the corrosion resisting characteristics. Otherwise, special riveted construction must be used to take the place of welding, and this is not possible with all designs.

Thin Coatings, Thick Coatings and Coverings

Thin coatings range in thickness from 5 to 10 mils. (.005 to 0.01 inch). The minimum thickness for a corrosion resistant coating is considered to be 5 mils. Thin coatings are generally applied as a liquid, by spray, brush, or dip. Most types usually are applied in three coats for long life economy and protection against "pin holes" or "porosity." Alternate colors are often applied to insure proper coverage for each coat.

Thick coatings range in thickness from 10 mils to 1/16 inch or more. Thick coatings may be applied by spray, hot or flame spray, or dip, and in some instances, by brush. Plastisols, liquid neoprene, and thermoplastic are examples of material used for thick coatings. Ample coats are applied for maximum protection against pin holes.

Coverings, such as sheet stock rubber or neoprene, as applied to fans are put on in the form of sheets using an adhesive. They range from 1/16 to ¼ inch in thickness, depending on type or duty. Sheet stock coverings eliminate the danger of porosity or pin holes possible with other types of coatings.

It may be stated generally that for a given type of coating material, the protection and the cost are in direct proportion to the thickness.

Limitations of Coating Materials

The adhesion properties must be such that the protective material will not separate or fly off under stresses caused by rotation. There must be no tendency to flow in the final state; otherwise, wheel balance will be disturbed. Coverings must be sufficiently workable to conform with the required contours and it must be possible and practical to seal adjoining sheets. Curing or dipping temperatures must be low enough not to damage or disturb the basic structure of the fan.

Design Modifications for Corrosion Resisting Fans

Thick coatings and coverings require the most exacting fan preparation. For Services *S* and *M*, this is most essential. All permanent joints of the fan are continuously welded, cleaned, and ground to a radius suitable for the coating. All sharp edges or corners are ground to a similar radius, and butt welded seams are ground to a smoothly curved surface. Removable fan parts are held in place by weld studs or other methods to protect the coating during removal or replacement. Additional bracing (if necessary), is provided to assure a rigid structure. Continuously welded companion flanges for duct or

TABLE I—CORROSION RESISTANCE GUIDE

Material	Standard Steel	Stainless Steel 304 316	Monel Metal	Brass or Bronze	Aluminum	Natural Rubber, Soft Lining	Natural Rubber, Hard Lining	Neoprene, Sheet Lining	Neoprene, Thick Coating	Vinyl Plastisol, Thick Coating	Phenolic Baked Thin Coating	Phenolic Air Dry Thin Coating	Epoxy Air Dry Thin Coating	Vinyl Air Dry Thin Coating	Chlorinated Rubber, Thin Ctg.	Bitumins Thin Coating
	Maximum Temperature, Deg F															
	800	800	800	X	150	170	170	250	200	150	400	140	150	140	120	120
Acetaldehyde	S	S	S	S	S	S	S	S	S	M	S	S	S	L	L	L
Acetic Acid	U	S	X	L	L	M	S	M	M	M	S	S	S	L	L	L
Acetone	S	S	S	S	S	L	L	L	L	U	S	S	S	U	L	U
Alcohols	S	S	S	S	S	S	S	S	S	M	S	S	S	L	L	L
Aluminum Chloride	U	U	U	U	U	S	S	S	S	S	S	S	S	S	L	M
Aluminum Sulfate	U	U	M	S	U	S	S	S	S	S	S	S	S	S	L	M
Ammonia Gas	X	S	U	U	X	S	S	S	S	S	L	L	M	S	L	L
Ammonium Chloride	U	U	U	U	U	S	S	S	S	S	S	S	S	S	L	M
Ammonium Hydroxide	S	S	L	U	S	S	S	S	S	S	L	L	M	S	L	L
Ammonium Nitrate	M	S	L	U	S	S	S	S	S	S	S	S	S	S	L	M
Ammonium Sulfate	U	U	M	U	U	S	S	S	S	S	S	S	S	S	L	M
Aniline	U	M	X	U	U	U	U	M	M	U	L	L	M	U	L	L
Beer	L	S	S	S	S	X	X	X	X	S	X	X	X	X	X	S
Benzene	S	S	S	S	S	U	U	U	U	L	S	S	S	L	U	U
Boric Acid	L	M	L	L	U	S	S	S	S	S	S	S	S	S	S	S
Butyl Acetate	M	S	S	S	S	U	U	L	L	U	S	S	S	U	L	L
Calcium Chloride	L	U	S	S	U	S	S	S	S	S	S	S	S	S	M	M
Calcium Hydroxide	M	M	S	M	U	S	S	S	S	S	M	M	S	S	M	M
Calcium Hypochlorite	L	L	L	L	U	S	S	M	M	S	L	L	M	S	M	L
Carbolic Acid	L	M	M	L	M	U	U	L	L	U	S	S	S	U	U	L
Carbon Disulfide	L	M	M	U	X	U	U	U	U	L	S	S	S	M	L	L
Carbon Tetrachloride	L	M	M	M	U	U	U	U	U	L	S	S	S	U	L	L
Carbonic Acid	L	M	L	M	M	S	S	S	S	S	S	S	S	S	L	L
Chlorine (wet)	U	U	U	U	U	M	S	M	M	M	L	L	L	L	U	U
Chlorine (dry)	M	L	M	M	U	S	S	S	S	S	S	S	S	S	M	M
Chlorobenzine	X	X	X	X	X	U	U	U	U	U	S	S	S	U	U	U
Chloroform	X	X	X	X	X	U	U	U	U	U	S	S	S	U	U	U
Chromic Acid	L	M	U	U	U	L	L	L	L	M	L	U	L	M	L	L
Citric Acid	U	S	M	M	L	M	S	M	M	S	S	S	S	S	M	M
Copper Sulfate	U	U	L	U	U	S	S	S	S	S	S	S	S	S	S	S
Diethyl Ether	M	M	M	M	M	U	U	U	U	U	S	S	S	U	U	U
Ethylene Glycol	M	S	M	M	M	S	S	S	S	S	S	S	S	S	S	M
Ferric Chloride	U	U	U	U	U	S	S	S	S	S	S	S	S	S	L	L
Ferric Sulfate	U	L	U	U	U	S	S	S	S	M	S	S	S	L	L	L
Formaldehyde	L	M	M	M	M	S	S	S	S	S	S	S	S	S	M	L
Formic Acid	U	M	M	M	U	S	S	S	S	S	S	S	S	S	M	L
Gasoline	M	S	M	M	M	U	U	M	M	S	S	S	S	S	U	U
Glycerine	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M
Hydrochloric Acid	U	U	U	U	U	S	S	M	M	S	S	S	S	S	L	L
Hydrofluoric Acid	U	U	U	U	U	S	S	M	M	M	S	S	S	L	M	L
Hydrogen Peroxide	U	M	X	U	M	M	M	S	S	M	L	L	M	L	L	L
Hydrogen Sulfide	U	L	U	U	M	S	S	S	S	S	S	S	S	S	M	M
Hypochlorous Acid	X	X	X	X	X	S	S	S	S	S	L	U	L	S	L	L
Kerosene	S	S	S	S	S	U	U	M	M	S	S	S	S	S	L	U
Lactic Acid	U	M	U	L	U	L	S	S	S	S	S	S	S	S	L	L
Lubricating Oils	S	S	S	S	S	U	U	S	S	S	S	S	S	S	L	U
Magnesium Sulfate	L	M	M	M	L	S	S	S	S	S	S	S	S	S	M	M
Methyl Ethyl Ketone	S	S	S	S	S	U	U	L	L	M	S	S	S	U	L	L
Milk	U	S	L	U	S	X	X	X	X	S	X	X	X	X	X	X
Mineral Oil	S	S	S	S	S	U	U	S	S	S	S	S	S	S	L	U
Nitric Acid	U	M	U	U	U	L	L	L	L	M	L	U	L	L	U	U
Nitro Benzene	X	X	X	X	X	U	U	U	U	L	S	S	S	L	U	U
Oleic Acid	L	S	S	X	S	L	L	U	M	M	S	S	S	L	L	L
Oxalic Acid	U	S	M	M	U	S	S	S	S	S	S	S	S	S	M	M
Perchloric Acid	X	X	X	X	X	S	S	S	S	S	L	L	L	M	X	X
Phenol	L	M	M	L	M	U	U	L	L	U	S	S	S	U	U	L
Phosforic Acid	U	M	M	M	U	S	S	S	S	S	S	S	S	S	L	L
Picric Acid	L	S	U	U	S	X	X	X	X	X	U	U	S	X	X	X

TABLE 1—CORROSION RESISTANCE GUIDE

Material	Standard Steel	Stainless Steel 304 316	Monel Metal	Brass or Bronze	Aluminum	Natural Rubber, Soft Lining	Natural Rubber, Hard Lining	Neoprene, Sheet Lining	Neoprene, Thick Coating	Vinyl Plastisol, Thick Coating	Phenolic Baked Thin Coating	Phenolic Air Dry Thin Coating	Epoxy Air Dry Thin Coating	Vinyl Air Dry Thin Coating	Chlorinated Rubber, Thin Ctg.	Bitumins Thin Coating
	Maximum Temperature, Deg F															
	800	800	800	X	150	170	170	250	200	150	400	140	150	140	120	120
Potassium Alum	X	X	X	X	X	S	S	S	S	S	S	S	S	S	M	M
Potassium Hydroxide	M	M	S	L	U	S	S	S	S	S	U	U	M	M	M	L
Potassium Permanganate	X	X	X	X	X	M	M	S	S	M	L	U	M	L	L	L
Potassium Sulfate	L	M	S	M	M	S	S	S	S	S	S	S	S	S	M	M
Sea Water	U	L	S	S	L	S	S	S	S	S	S	S	S	S	S	S
Silver Nitrate	X	X	X	X	X	S	S	S	S	S	S	S	S	S	S	M
Sodium Bisulfate	U	M	X	M	M	S	S	S	S	S	S	S	S	S	M	M
Sodium Carbonate	M	M	M	M	M	S	S	S	S	S	L	U	M	S	M	L
Sodium Chloride	M	M	M	M	L	S	S	S	S	S	S	S	S	S	S	S
Sodium Hydroxide	S	S	S	M	U	S	S	S	S	S	L	U	M	S	M	L
Sodium Hypochlorite	U	L	U	U	U	M	M	M	M	M	L	U	L	L	L	L
Sodium Nitrate	M	S	M	L	M	S	S	S	S	S	S	S	S	S	M	M
Sodium Sulfate	L	M	S	S	S	S	S	S	S	S	S	S	S	S	M	M
Sodium Sulfite	U	M	M	M	X	S	S	S	S	S	S	S	S	S	M	M
Sulfur	M	M	M	U	U	M	M	M	M	X	X	X	X	X	X	X
Sulfuric Acid	U	U	L	U	U	M	M	M	M	M	S	S	S	L	L	L
Sulfurous Acid	U	L	U	L	M	L	L	L	L	X	S	S	S	M	X	X
Sulfur Dioxide	L	L	S	U	X	U	U	U	U	X	S	S	X	X	X	X
Tartaric Acid	U	S	S	U	S	S	S	S	S	X	X	X	X	X	X	M
Toluene	X	X	X	X	X	U	U	U	U	L	S	S	S	U	L	L
Trichloroethylene	L	M	S	M	M	U	U	U	U	L	S	S	S	U	L	L
Turpentine	L	S	S	L	S	U	U	U	U	X	X	X	X	X	X	X
Vegetable Oils	S	S	S	S	S	U	U	L	L	X	S	S	S	X	X	X
Vinegar	L	S	S	L	L	S	S	S	S	X	X	X	X	X	X	X
Water	M	S	S	S	S	S	S	M	M	S	S	S	S	S	S	S
Zinc Sulfate	L	X	S	L	X	S	S	S	S	X	S	S	S	X	X	M

S Severe corrosion service. Suitable for heavy concentrations of undiluted fumes; liquid contact due to carry-over, splashing or condensation; solid material to gas stream; lower concentration of highly corrosive agents.

M Moderate corrosion service. Suitable for normal fan requirements; mixture of fumes and air; no direct contact with liquid or solid corrosive but moisture may be combined with fumes.

L Light corrosion service. Suitable for intermittent exposure to light fume concentration. Maintenance coatings particularly for fan exteriors.

U Unsuited for use against corrosive agent listed.

X No data available.

stack connections are provided. Pin holes in welds or castings are avoided or filled especially when the coating or lining is to be heat cured, as air trapped in pin holes will expand under heat treatment and cause separation between the coating and the metal.

Where necessary, fan wheels are strengthened and shaft and bearing sizes increased to carry the increased weight of the coating or lining.

Sandblasted Base

A sandblasted base surface is a "must" for thick coatings or coverings, and undoubtedly best for every type of protective paint or coating. Surfaces are freed of dirt, scale, rust and grease and are primed according to the coating manufacturer's directions.

Type *L* service normally requires limited modifications of the standard fan. Surfaces are freed of dirt, scale, rust and grease prior to application of coatings.

Materials Available for Protective Coatings

The following are materials most commonly used for fan protection:

Natural Rubber is applied to fans over 12-inch wheel diameter in the form of sheet stock. Smaller fans are dipped or sprayed with latex. Rubber in any form requires curing or vulcanizing by heat. Natural rubber is resistant to all common inorganic acids and alkalis; it is also resistant to alcohol, but is softened by hydrocarbon solvents. Soft rubber is abrasion resistant; hard rubber is generally more chemical resistant. Maximum permissible gas temperature is 170 deg F.

Synthetic Rubber

Neoprene is the most common synthetic rubber, having chemical resistance similar to natural rubber, but in addition, being more resistant to oxidizing agents and also to many hydrocarbons and oils. Heat resistance is also greater, and neoprene may be used for temperatures as high as 250 deg F.

Corrosion Resistance Guide

Table 1 is designed to serve as a guide to the corrosion resisting characteristics of various materials, linings and

coatings. The data contained have been taken from material published by various manufacturers, and will, of course, vary to some extent with the particular product.

It has been set up to show the type of corrosion service the material or coating is capable of handling. In many cases, thick coatings, thin coatings and linings show equal service ratings. In these cases the relative merits should be evaluated according to cost and service life.

Neoprene is available as sheet stock and in liquid form for thick or thin coatings. Sheet stock is vulcanized by heat, but liquid coatings are more often vulcanized by catalytic action.

Phenolics

Phenolic resins are thermosetting plastic, such as baked Heresite, which are normally polymerized by baking at temperatures from 300 to 350 deg. Phenolic coatings are resistant to all common solvents and inorganic acids, but are attacked by caustics, alkalis and oxidizing agents. Phenolics are applied as thin coatings by spraying, and proper thickness is built up through a number of coats with partial cure between applications. Maximum temperature is 350 deg. The result is a tough and moderately abrasion-resistant surface. Phenolics such as Heresite are also available as air-dried coatings which are polymerized or hardened to a final state through the presence of a catalytic or accelerating agent. However, the baked version is generally considered superior because of greater density and less porosity.

Epoxys

Epoxy resins such as DuPont 823, are somewhat similar to phenolics but have greater alkali resistances. They are generally available as air-dried thin coatings which are polymerized by catalytic action. Thickness per coat is generally greater than phenolic coatings.

Vinyls

Vinyls are thermoplastic materials with excellent general acid and alkali resistance. They are unaffected by some hydrocarbons and have a fair resistance to oxidizing atmospheres. Because of their thermoplastic nature, maximum temperature is 140 deg. Vinyls in solvent solutions (such as Metalast) are applied as thin coatings by spraying.

Thick vinyl coatings may be obtained by applying a plastisol (nonsolvent vinyl plastic solution) by spray or dip. Plastisol coatings require baking for final fusion of the film.

Chlorinated Rubber Paint

Chlorinated rubber paint forms a tough resinous coating which has no properties in common with rubber. It possesses good resistance to alkalis, caustics, and some mineral acids, but is attacked by most hydrocarbons and generally has poor resistance to oxidizing agents. Chlorinated rubber paint is generally available in thin coatings which may be applied by brush or spray and is commonly used in Type *L* service.

Bitumins

These products are available in coal tar or asphaltum types for thin coatings. They offer relatively low-cost protection against mild acid fumes, but are not recommended for exposure to caustics. In general, they are recommended only for Type *L* service, and many require frequent reapplications, or at least, retouching.

Oil Base Paints

These cannot be recommended for most types of chemical exposure. They are satisfactory mainly for weather and moisture resistance.

Selection of Protection

The only sure guide in the selection of a metal or coating to resist corrosion is by determination of actual performance of the material under like operating conditions. Any other basis necessarily involves a calculated risk. If a material gives lasting protection in tanks and piping which are handling the corrosive, it is reasonable to assume that the same material will provide the same degree of protection in the fan. The Corrosion Resistance Guide (Table 1) is an excellent source for the tentative selection of materials. The purchaser or user, employing the corrosive, rightfully assumes the responsibility as to the corrosive agent, its concentration, moisture content, temperature, and ultimate specifications of the desired corrosion protection. Some manufacturers will determine whether a coating can be satisfactorily applied to the applicable fan, or in the case of special metals, whether the fan can be fabricated satisfactorily.

The Air Moving and Conditioning Association (successor to the NAFM) recognizes the hazards of corrosion, and in this regard AMCA Bulletin 110 states: "To study the effect of abrasion, erosion, *corrosion* or excessive heat, the Engineering Committee of the association has been investigating and experimenting with plate alloys, materials, coatings, and forms of construction. To date no materials or means have been discovered which will effectively and completely resist all such effects. Some materials are better than others. The resistance to such effects, therefore, is one of degree only.

"Experience having shown, on the basis of present-dav knowledge, that abrasion, erosion, *corrosion* or deterioration from excessive heat are speculative assumptions of maintenance, it is the policy of the association to advise buyers of fan equipment that guarantees covering such conditions cannot be made in good faith."

Where coatings are used, the fan surface will be prepared and the material applied strictly in accordance with such manufacturer's instructions. In the case of protective coatings or linings, applied by others, the warranty of the applicator shall apply.

'Gas-tight' Fans

In many instances, it is important that leakage from a fan be kept to a minimum when it is handling corrosive. inflammable or otherwise dangerous fumes. There are no industry standards for gas-tight fans. However, one particular standard which Westinghouse maintains for AMCA arrangements, 1, 8, or 9 is as follows:

1. *Dust-tight*—This represents a reasonable degree of tight construction in those joints of the fan that are under pressure in normal operation. If fly ash or other fine dusts were to be fed through such a fan, no dust streaks should be observed at the various joints. A standard rubbing shaft seal is provided.

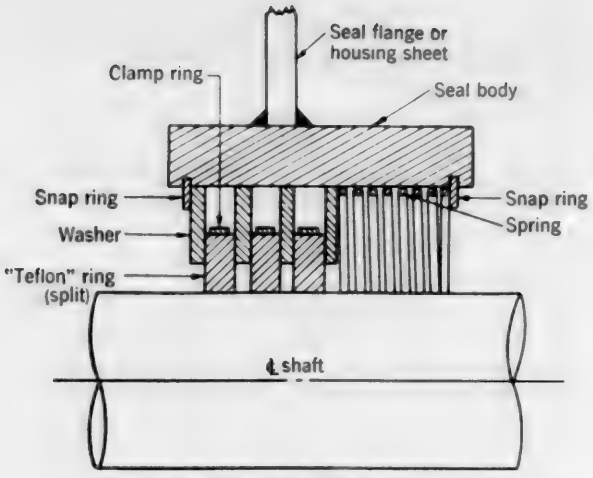


Fig. 2. Details of a stuffing box seal.

2. *Gas-tight*—This represents construction tight enough to prevent leakage of gas under normal operating pressure. Gas leakage would be small and considered quite acceptable in gas plants, solvent recovery and like applications. Manufacturing quality control includes a soap suds bubble check test to insure that the construction is suitably tight. Removable portions of the fan are provided with additional bolts and gaskets and, where necessary, machined surfaces are used. Inlet and outlet flanges are furnished suitable for welded or properly gasketed connection to customer's companion flanges. A stuffing box seal as illustrated in Fig. 2 will be furnished at the shaft opening as standard.

When required for particular applications, centrifugal water seals or water lubricated carbon ring seals may be furnished for operating or standby service. Flanged connections machined to a plane surface are also available. For extreme applications as encountered in atomic energy plants or when extremely toxic gases are being handled, special construction and sealing devices can be provided.

Spark Resistant Construction

To meet hazardous flammable or explosive conditions, fans can be supplied according to the AMCA adopted standards for spark resistant fans. These standards are listed in AMCA Bulletin 110, page 10 and are as follows:

Type	Construction
A	All parts of the fan in contact with the air or gas being handled shall be made of nonferrous material.
B	The fan shall have an entirely nonferrous wheel and a nonferrous ring about the opening through which the shaft passes.
C	The fan shall be so constructed that a shift of the wheel or shaft will not permit two ferrous parts of the fan to rub or strike.

Bearings shall not be placed in either the air or the gas stream.

The user shall electrically ground all fan parts.

Specifically, construction might be as follows:

Type *A* consists of an aluminum wheel, an aluminum housing, and a monel shaft. Other external fan parts are standard steel.

Type *B* consists of an aluminum wheel and an aluminum rubbing ring where the shaft passes through the housing.

Type *C* consists of aluminum inlet and cone.

Air Pollution Problems Will Increase

"Our confidence in the abundance of the four principal elements of our forefathers has been severely shaken in recent years," according to A. J. Haagen-Smit, professor of biochemistry at California Institute of Technology, writing in the October 17, 1958, issue of *Science*. He continues by stating that we have learned that the increasing population will have less room in which to grow its crops and keep its cattle. Coal, oil, and gas reserves have definite time limits, and we might have had to face a major war over water rights had our ancestors not been wise enough to create a United States of America. Finally, our supposedly infinite supply of air has turned out to be limited, too. With the advent of atomic energy, many of these problems can be solved, but the universal use of atomic energy will make the problem of keeping our air fit to breathe even more difficult. Now we are concerned with constituents present in concentrations of a few parts per million. The future, and part of the present, generation must worry about the removal of pollutants present in quantities smaller by a factor of many powers of ten. In this more efficient cleaning process, the theoretical knowledge and technical skill required will be far greater than the knowledge and skill available today.

It is understandable that there has been resistance to the installation of costly control equipment which often does not contribute in a direct manner to profits. Some of the objections have been removed in recent years, and it is now generally conceded that damage from air pollution is large and that recovery measures often pay for themselves and in some cases may even make profits. Corrosion due to the emission of various chemicals is a source of tremendous expense to the public. Recovery methods will reduce this corrosion and will also lower the cleaning bills for the outside, as well as the inside, of our houses. But even if no direct profit is made, the many intangibles make it worth while to improve working conditions. The standard of living of the workers is raised, and possible adverse effects on their health are eliminated. This contributes to an increased efficiency on the part of the worker. It also raises the value of the industrial property and of the surrounding real estate. In many cases, management has gone much further than merely curing existing air pollution problems. At the present time, climatological and topographical conditions are examined carefully in selecting the site for new industry, and in the construction of new buildings the installation of air-pollution-control equipment is considered beforehand, rather than at a time when public relations have suffered a severe setback.

The old slogan, "Prosperity is measured by the number of smoking stacks," is no longer true. Today, prosperity can be gaged by the number of strange-looking bulges protruding from the roofs of the factories. These bulges are dust- and fume-collectors.

When permissible starting current is limited, consider

Part Winding Starting

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Industrial Engineering Section
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Much air conditioning, heating, and ventilation equipment is installed in properties which are served by combination light and power secondary distribution networks owned by public utilities. To protect other subscribers with respect to voltage maintenance and the avoidance of light flickers, power companies impose limitations on the largest-rated squirrel-cage motor which they allow to be started "across the line." Starting equipment must then be used which reduces the motor starting inrush current. Part winding starting is a desirable and economical starting method which merits consideration when designing equipment powered by integral horsepower motors of sizes for which the power companies prescribe limitations on the permissible starting current.

THERE was a time when three-phase squirrel-cage motors could not be started by "throwing them across the line," that is to say, by applying full line voltage to the motor terminals. Reduced-voltage starting was resorted to, the prototype being the venerable "starting compensator." Progress in motor design improved starting characteristics, and today's squirrel-cage motors, designed in accordance with NEMA standards applying to industrial-type three-phase motors, can be started on full voltage without damage to the motor. Reduced-voltage starting, when used today, is not selected because of motor limitations, but because of limitations due to the driven machinery or the power system.

An example of the former limitation is textile machinery, the weakness of the material in process making it desirable to have a "soft" start, and reduced-voltage starting is used to reduce the initial motor starting torque. When motors are connected to industrial power systems which exist for intra-plant power service only, and which service neither outside subscribers nor lighting loads, the need for reduced-voltage starting is not widespread. This method of starting needs to be resorted to only in cases where the motor feeder is too weak to sustain volt-

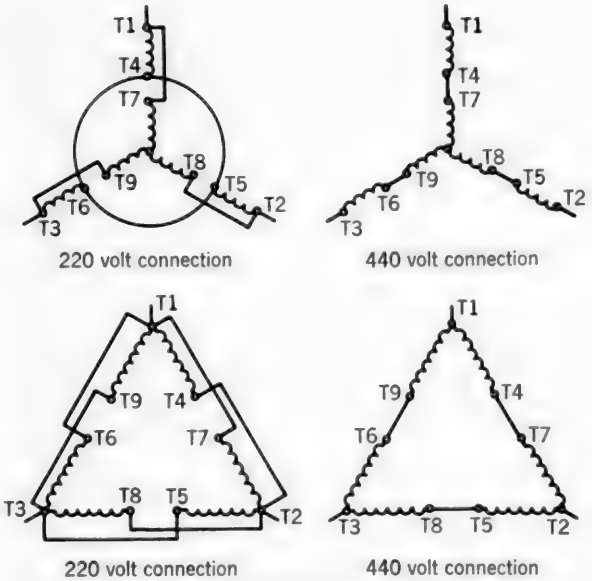

Fig. 1. Connections of 220/440 volt dual voltage squirrel cage motors.

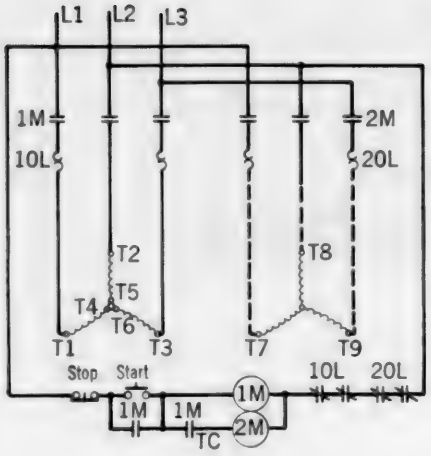

Fig. 2. (Left) Half-winding starter for wye-connected 6- and 9-lead (dual voltage) motors using 3/3 pole contactors.

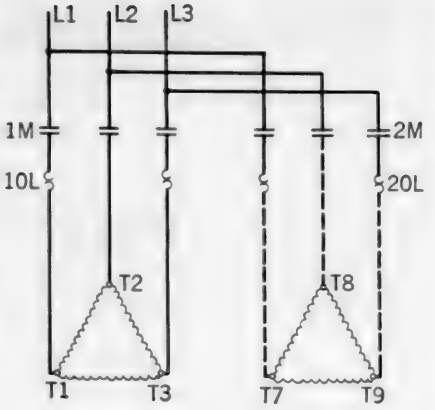

Fig. 3. (Right) Half-winding starter for delta-connected 6-lead motors using 3/3 pole contactors.

age under the motor starting current inrush, either preventing the motor from starting properly or causing other motors on the same feeder to stall. Reduced-voltage starting under these conditions is used only on comparatively large motors.

An entirely different situation exists when motors are connected to a combination power and light distribution system on which lighting and motor loads are connected to the same transformer and the same feeder lines. This condition is most frequently encountered when small industrial or commercial users are connected to a general distribution network owned and operated by a public utility. The factor limiting the size of motors which can be started on full voltage then becomes the occurrence of light flickers.

Intensity of light output is reduced by the line voltage drop due to motor starting current inrush. This reduction in intensity, called "flicker," causes annoyance to customers of utilities. In order to avoid complaints from householders, utilities have established rules which govern the largest size motor which may be started across the line on a combination power and light circuit. Annoyance by light flicker is a physiological as well as a psychological phenomenon. The degree of annoyance depends on severity of the flickers and the frequency with which they occur. Objectionable voltage drops due to motor starting inrush vary from a fraction of one percent to approximately 5 percent. On most industrial and commercial applications, the threshhold value of objectionable drop will be of the order of one or two percent. This is a much more severe restriction than the 10% drop below rated motor voltage which would be permissible on a power circuit and still obtain generally satisfactory motor starting and running performance.

No general rules have been established in national standards defining the largest size motor which may be started across the line on a combination light and power circuit. Each utility company establishes its own rules, which may vary for different sections of the distribution system. Power company engineers evaluate the power system layout, size of feeder conductors, present load and estimated future load, and they establish the largest size motor for which full-voltage starting would be tolerable. This information is usually given to the subscriber on a personal basis.

Combination power and light circuits are mostly 240/120 volt or 208/120 volt three-phase, four-wire circuits, motors rated 220 volts being connected to the 240 or 208 volt lines respectively. Large motors will seldom be connected to these circuits. The bulk of motors will be rated 10 hp or less, with a few motors up to 100 hp and an occasional motor of larger size. Standard general-purpose squirrel-cage motors in these sizes are generally built with two circuits per phase in the stator winding,

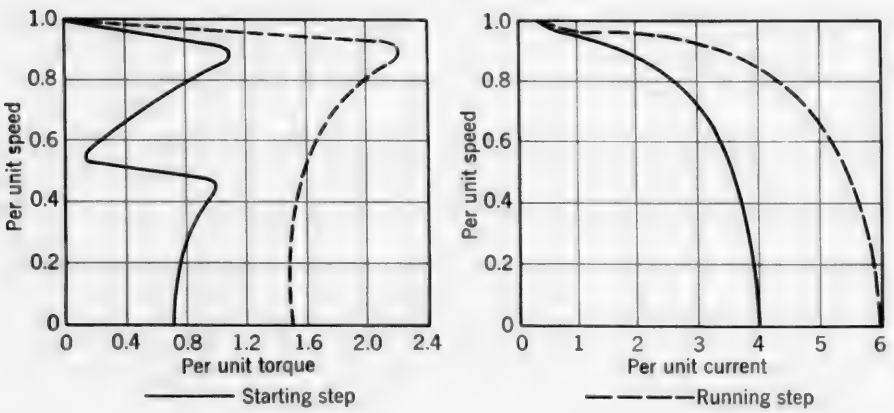

Fig. 4. Performance curves for half-winding starting of wye-connected 6-lead and 9-lead (dual voltage) motors and delta-connected 6-lead motors.

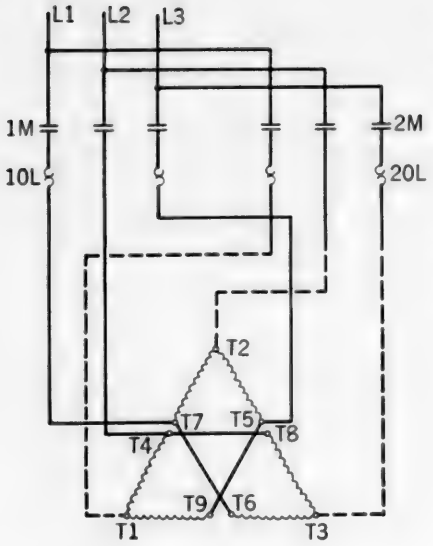

Fig. 5. (Left) Half-winding starter for delta-connected 9-lead (dual voltage) motors using 3/3 pole contactors.

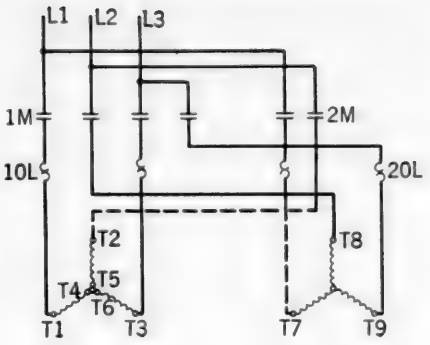

Fig. 6. (Right) Two-third winding starter for wye-connected 6-lead and 9-lead (dual voltage) motors using 4/2 pole contactors.

with both halves of each winding brought out to the conduit box. These motors (called dual-voltage motors) are reconnectable for service on 440 or 220 volt circuits. As illustrated in Fig. 1, the halves of each winding are connected in series for 440 volt service, or in parallel for 220 or 208 volt service.

The 220-volt connection with two parallel windings offers a convenient means of reducing the starting inrush current by connecting the motor to the line in two steps. With this so-called "part winding" starting method, part of the motor winding is connected to the line on the first step and the remainder of the winding on the second step.

Half-Winding Starting Method

The earliest and most obvious method of part-winding starting is to use two three-pole contactors, each to connect one half of the motor winding to the line. A starter of this type is shown in Fig 2. Pressing the start button energizes contactor 1M. A time-delay closing interlock (marked TC on the diagram) on 1M energizes the second contactor 2M after an adjustable time delay. Motor connections established on the first step are in solid lines, those established on the second step are in broken lines.

Motor connections are shown for a dual-voltage 220/440 volt wye-connected motor with 9 leads brought out. On each starting step, a full wye of winding halves is connected in the circuit. A permanent connection is made in the motor conduit box to form the wye point of one of the winding halves. Motors are also built sometimes specifically for part-winding starting in which case only 6 leads are brought out and the wye points of both winding halves are formed internally in the motor. Outside connections are same as indicated in Fig. 2.

The half-winding starting method can also be used for motors having delta-connected windings. When motors are built especially for part-winding starting, two separate and similar windings are arranged in the stator slots, and six leads are brought out. The motor power connections are illustrated in Fig. 3, control circuits are same as in Fig. 2. Motors as shown in Fig. 3 are designed for operation at one voltage; they are not reconnectable.

Figure 4 illustrates the performance of wye-connected 6-lead or 9-lead motors and delta-connected 6-lead motors when started by the half-winding starting method. The solid curves indicate motor performance on the starting step, whereas the broken curves pertain to the running stop with the whole motor winding in service. The detailed values of torque and current vary to some extent among different motors. However, a few general facts

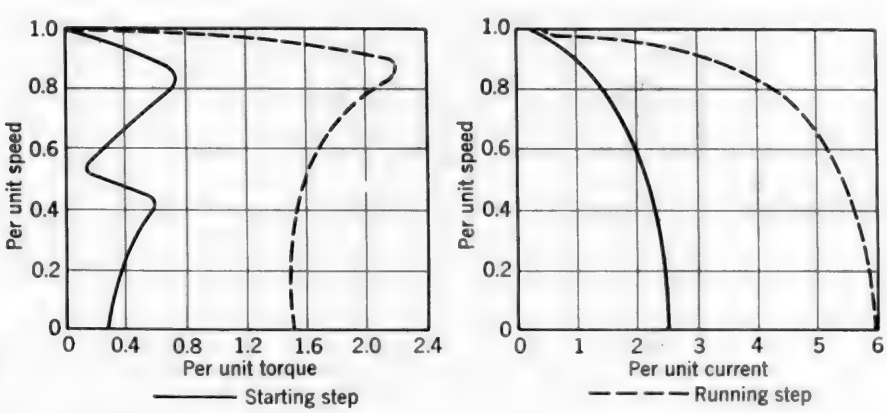

Fig. 7. Performance curves for half-winding starting of delta-connected 9-lead (dual voltage) motors.

TABLE 1—COMPARISON OF PART WINDING STARTING METHODS

Starting Method	Motor Winding	Dual Voltage (6-lead or 9-lead)	Percent of Average Full-Voltage Starting Current	Percent of Full-Voltage Starting Torque	Starting Current Balanced
1/2 winding start	Wye or delta	No (6-leads)	65	45	Yes
1/2 winding start	Wye	Yes (9-leads)	65	45	Yes
1/2 winding start	Delta	Yes (9-leads)	40	20	Yes
2/3 winding start	Wye or delta	No (6-leads)	65	45	No
2/3 winding start	Wye or delta	Yes (9-leads)	65	45	No

are indicated by these curves.

Starting torque available is less than rated motor torque. On an average, it is reduced to approximately 45% of normal full-voltage starting torque. With a motor loaded, this starting torque may not be sufficient to break away the drive, and the motor may not start on the first starting step, but starts on the second step, when full starting torque becomes available. Such starting on the second step is not objectionable from the point-of-view of the power system since the motor starting inrush current is broken into two increments, so that feeder voltage regulators have an opportunity to adjust feeder voltage between starting steps.

Motors starting lightly loaded, as on pump, fan, rotary compressor, and similar drives, will start on the first starting step. Second harmonies occurring in the half-winding driving starting produce a pronounced dip in torque at half speed. The motor may not accelerate beyond the half-speed point on the starting step, full acceleration taking place on the second step after the full motor winding has been energized.

Starting current is reduced to approximately 65% of the locked-rotor motor current. Assuming a locked-rotor current of approximately 6 times motor full-load current, the current inrush on the starting step is reduced to approximately 4 times motor full-load current.

Delta-connected dual-voltage motors have 9-leads brought out. Not all of these motors have symmetric windings, and a connection equivalent to the one shown in Fig. 3 may result in severe vibration and unsatisfactory torque on the starting step. A preferred connection of the motor stator circuit is the one shown in Fig. 5. During starting, motor windings are so connected that two halves are in series between two line phases. During running, the motor windings form two parallel deltas.

Performance is indicated in Fig. 7. Performance curves are similar to those of Fig. 4, except starting torque and starting current are reduced. The starting torque is approximately 20% of normal full-voltage starting torque. A severe dip occurs at approximately half speed. Starting current is reduced to approximately 40% of locked-rotor motor current. Since this current is generally of the order of 6 times motor full-load current, the inrush current on the starting step is reduced to about 2.4 times motor full-load current.

Two-Third Winding Starting Method

Severity of the torque dip can be reduced by a starting scheme with which 2/3 of the total motor winding is energized on the first step. Power circuits of such a starter are shown in Fig. 6; control circuit connections are same as in Fig. 2. The starter contains two contactors, one four-pole and one two-pole unit. When the start contactor 1M closes, two winding branches are energized namely T1-T3 and T8-T9. These two branches produce a somewhat unsymmetrical flux pattern, similar to a two-phase winding in Scott connection. Motor windings are drawn for a dual-voltage wye connected motor with 9 leads brought out. Connections for a 6-lead wye-connected motor are the same except that wye point T4-T5-T6 is formed internally in the motor. A view of such a starter is given in Fig. 8. To the left is a 4-pole contactor 1M and at the bottom is its time-delay sequencing interlock. To the right is the two-pole contactor.

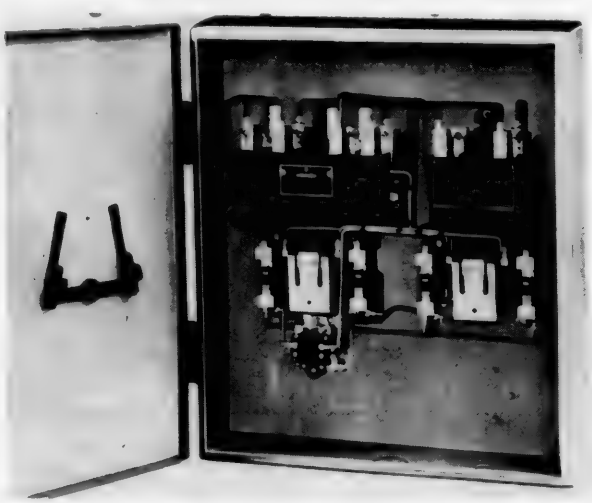

TABLE 2—NEMA RATINGS OF PART WINDING STARTERS

Size of Starter	Continuous Rating in Amperes	Horsepower Rating	
		220 volts	440/550 volts
1 PW	27	15	20
2 PW	45	30	50
3 PW	90	60	100
4 PW	135	100	200
5 PW	270	200	400

Fig. 8. Size 2 part-winding starter using 4/2 pole contactors, universal starter suitable for use as one-half or two-third winding starter.

Four thermal overload relay units are assembled to the sides of the contactors, two on each unit. If third-phase overload protection is needed, six overload relays can be included.

The two-third winding starting method can also be applied to delta-connected motors. Fig. 10 shows connections to a dual-voltage 220/440 volt motor with 9 leads. On the starting step, all branches of the stator winding carry current but only two winding halves carry full current (T4-T1-T9), whereas the other branches carry only half current, two winding halves being in series across each line phase. The motor winding is connected in open delta across line phases L1-L3 and L1-L2, phase L2-L3 being open. This connection is equivalent to two-third winding being energized.

Performance curves of the two-third winding starting method are plotted in Fig. 9. While different motors vary in detail, these curves bring out the following salient facts by comparison with performance of the half winding starting method as illustrated in Fig. 4:

1. In regard to starting torque, there is no significant difference between the two starting methods. Depending on details of winding design, the two-third winding method may obtain somewhat higher or somewhat lower starting torque than the half-winding starting method. However, the difference is not sufficient to have an effect on the choice of either starting method.
2. The torque dip at half speed is reduced significantly. The exact amount of torque dip varies with different motors, but there is a high degree of probability that a motor, driving a fan load, will be capable of accelerating to full speed on the starting connection, resulting in a smaller current inrush when switching over to the running connection.
3. Starting current is approximately the same as with half-winding starting. The current as indicated in Fig. 9 is an average current. Since the three phases are not loaded symmetrically, one phase carries 78%, and the other phases carry 55% of locked-rotor current of 6 times normal, the currents in the three phases would be 3.3, 3.3, and 4.7, or an average of 4 times motor full-load current. Some power companies consider the highest phase current, rather than the average current, when ruling on the acceptability of a given starter application.

Other points in favor of two-third winding starting are the reduction in vibration and noise during the starting period, on account of the smoother starting torque characteristic, which permits the motor to accelerate to nearly full speed, once the motor has started. Also, full acceleration on the starting step reduces the current peak which occurs when connections are changed to the running step.

Application Pointers

Since any starting method reducing the starting inrush current also reduces the starting torque available from the motor, the question comes up whether the motor should actually be expected to start on the starting step. This is not necessarily required in such cases when reduced-voltage starting is used to meet power company requirements for reducing starting current inrush. To the power company it makes no difference whether or not the motor turns over on the starting step. If the driven machine is capable of being started with a full-voltage starter, it is immaterial to the machine whether it is subjected to full motor starting torque initially or after transfer of the control to the running step.

Part-winding starters, compared to reduced-voltage starters, require a lesser number of component parts which makes them attractive from an economic point of view. However, before the decision is made to use part-winding starting, consideration should be given to some general pointers on this starting method.

a. While the motor runs on the starting connection, flux distribution in the stator is not symmetrical, a certain amount of vibration and noise occurs during starting which tends to reduce the life expectancy of the motor. Part-winding starting should not be used for drives which are started frequently.
b. The timing of the interlock initiating the transfer to the running connection should be set as short as possible. Vibration and noise may be developed by the motor on the starting step and they must be accepted as a characteristic of part-winding starting. The time during which the motor stays on the starting step should be kept as short as possible.
c. Possible severe vibration when the motor stands still on the starting step makes part winding starting undesirable for drives requiring high starting torque. Part-winding starting is best suited for drives having the characteristic of a fan load.

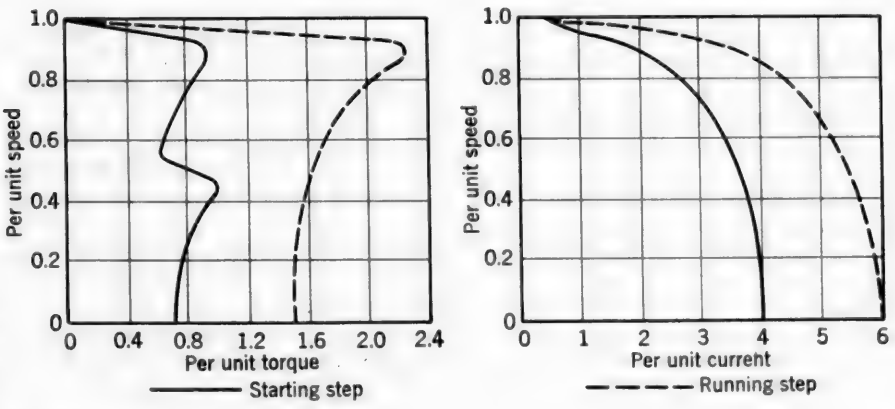

Fig. 9. Performance curves for two-third winding starting of wye or delta connected 6-lead or 9-lead (dual voltage) motors.

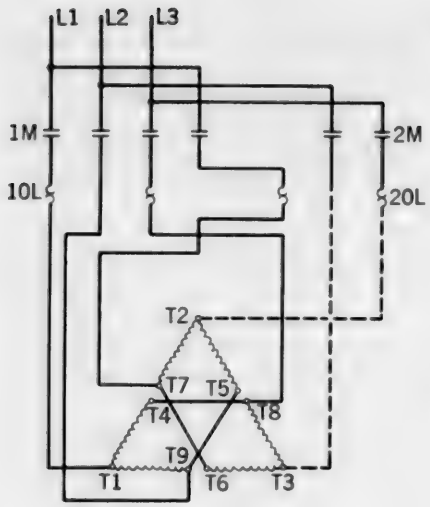

Fig. 10. (Left) Two-third winding starter for delta-connected 9-lead (dual voltage) motors using 4/2 pole contactors.

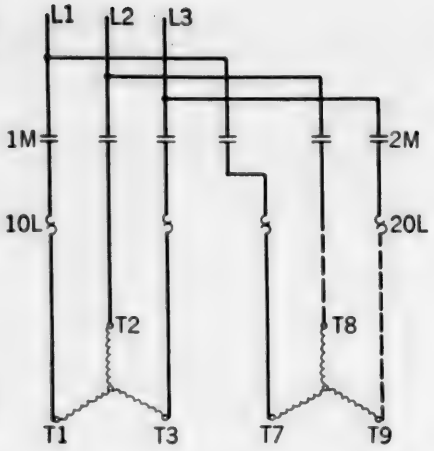

Fig. 11. (Right) Universal starter with 4/2 pole contactors used for one-half winding starting.

Centrifugal compressors generally have a break-away torque of the order of 20% of full-load torque. Any starting system permitting a motor to develop a starting torque of, say, 25% or more will start a centrifugal compressor. When a motor drives a reciprocating compressor, the break-away torque may vary between 20 and 150% of full-load torque, depending on whether or not the cylinders of the compressor are unloaded. Whether or not the compressor will start on the first step will depend on the degree to which it is unloaded.

Part-winding starting is well suited for use on ventilating and air conditioning equipments for residential or commercial properties served by combination power and light circuits. Once the decision has been made to consider part-winding starting, the data given in Table 1, will serve as a guide to evaluate the various available starting methods. While this table must not be considered as being accurate for all possible motor and starter combinations, it does give a useful comparison for average conditions.

Half-winding starting may not permit the motor to accelerate beyond 50% speed, and transfer to the running connection at that speed will result in a current peak which is of the order of 90% of the motor locked rotor current. This disadvantage may be avoided by the two-third winding start. Because of a lesser dip in torque at 50% speed, the motor will probably accelerate to nearly full speed on the start connection, thereby reducing the current peak resulting from a transfer to the running connection.

Recognizing the importance which part winding starters have attained in the industry, NEMA (National Electrical Manufacturers Association) has established standard horsepower ratings which are listed in Table 2.

Universal Starter

Practical considerations may prevent a free choice of the most desirable starting method for a given installation. Wye or delta connection of the motor may be imposed on the user by availability and stock position of a given size and make of motor. Although in most cases, the two-third winding method obtains less vibration and noise during starting, many variables enter into the vibration problem, and the electrical and mechanical configuration of the motor winding has a decided effect. It may happen that a particular motor operates more quietly with a half-winding than with a two-third winding starting start. It would be desirable to have a universal starter available which would permit a changeover from one starting method to the other at the installation.

Either starting method requires two contactors having a total of six poles. Half winding starting can be accomplished with two three-pole contactors. Two-third winding starting requires one four-pole and one two-pole contactor. However, the 4/2 pole starter can also be used for half winding starting, as illustrated in Fig. 11. Therefore, to obtain greatest flexibility in making final adjustment of motor connections at the installation, it is recommended to provide starters with a 4/2 pole contactor combination.

Branch-Circuit Protection

Motor overload relays are connected in both halves of the motor winding to insure protection of the motor during starting and during running. This means that overload relay heaters are selected for one half of the motor horsepower ratings.

This brings up a question concerning the selection of devices for protecting the motor branch-circuit against fault currents. To protect the motor starter, the most vulnerable components of which are the overload relay heaters, the National Electrical Code requires that fuses or circuit breakers be selected for a current rating not to exceed 400% of the current rating of the overload relays. This means that fuses or circuit breakers for protecting a part winding would have to be selected on the basis of twice motor full-load current.

Circuit breakers with time-delay trips can be selected on this basis and still permit the motor to be started. However, straight one-time fuses having a rating of twice motor full-load current cannot be expected to let the motor start, and frequent nuisance blowing would result. When fuses are selected for branch circuit protection time-lag fuses having a rating of not more than twice motor full-load current should be used.

WATER HEATING FOR COMMERCIAL KITCHENS

Prepared by the Following Members of the Water Heating and Steam Generation Committee of the American Gas Association

THOMAS Z. DUNN, Commercial Sales Manager, The Ohio Fuel Gas Company, Columbus, Ohio. *Chairman.*
R. N. SPEAR, General Commercial Sales Manager, Ruud Manufacturing Company, Kalamazoo, Mich.*
BERNARD E. TWIGG, Commercial Representative, Citizens Gas & Coke Utility, Indianapolis, Ind.
DON WILLIAMS, Manager, Commercial Water Heater and Boiler Sales, A. O. Smith Corporation, Kankakee, Ill.*

* Representative of Gas Appliance Manufacturers Association

Here is a guide to the proper sizing, selection and installation of gas-fired water heating systems for all types of restaurants and cafeterias. This article discusses the need for ample quantities of both 180 and 140 deg F water to meet modern standards of sanitation; various types of dishwashing equipment are described, including arrangements and sizes of water heating apparatus. Basic information is furnished on water and gas piping, venting and required clearances.

Water Heating for Commercial Kitchens

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DUE to an increased demand for sanitation by health officers and the public, hot water of higher temperature and in larger amounts is now required in commercial, institutional and industrial food service establishments. Clean and sanitary dishes, glassware and silver are essential for serving good food and drink. Improved sanitation offers a fine opportunity for reducing potential hazards to health. Ample hot water at the right temperature and at the lowest possible generating cost is needed. The means for producing this hot water must be carefully chosen.

Dishwashing requires an adequate 180 deg water supply for the final rinse, to insure thoroughly sanitary dishes. Savings from the elimination of toweling and polishing plus the assurance that dishes and silverware are thoroughly clean and germ-free, far outweigh the small additional operating cost for providing this higher water temperature.

In addition, an ample supply of general purpose hot water is required for personal use, dishwashing, pot washing, general cleaning and other uses in a restaurant to meet modern standards of sanitation.

Standards of cleanliness for commercial food service establishments are well established. The U. S. Public Health Service, The National Sanitation Foundation (NSF), and other important health and sanitation bodies have contributed to the formation of workable rules. Certain of these rules assume that dishes in public eating places are sufficiently bacteria free. Standards for the design of dishwashing equipment and water heaters, as needed by the restaurants, have been published by The National Sanitation Foundation working closely with the industry involved. It is toward the maintenance of these standards that the Public Health Officer is concerned.

In the restaurant, bacteria kill is usually achieved by exposing the washed dish to a rinse of 180 deg water for several seconds. All concerned with the problem of insuring that the equipment selected will provide the hot water needed at the temperature required also want the most simple system possible, and equipment which will provide adequate service over a long period. Data are provided here that will help in the equipment selection.

TYPES OF DISHWASHING MACHINES

A wide variety of dishwashing equipment is available for use in the kitchen of large restaurants.

Spray Type

In general, spray type dishwashing equipment can be classified as door type or conveyor type.

The door type machine is generally identified as having a solid door which must be opened and closed manually to process each rack of dishes. This type includes upright models, hood type counter models, and undercounter models. Standard sizes are 16-inch x 16-inch, 18-inch x 18-inch and 20-inch x 20-inch. Size is determined by measuring the dish rack width.

Conveyor type machines are identified by their open ends or lack of doors. The conveyor can be either mechanically or manually operated. Manually operated (commonly called Push Thru) conveyor machines are not NSF approved.

Spray types of dishwashers have varying capacities and use hot water at different rates. It is, therefore, necessary to compute the hot water requirements for the particular type of dishwasher involved. Most manufacturers of dishwashing machines include in their literature information on the rate of flow of 180 deg water and the number of gallons required by the machine *per hour*. This rate of flow information must be used with care, since in most types of machines, the dishwasher sprays are not open in the "full on" position for a period of one hour, but are turned on and off either by the operator or by the racks passing through the machine. Some manufacturers are now furnishing timing mechanisms as an optional feature which assure an adequate rinse period.

The temperature and volume of water, time of spraying, spray pattern and nozzle size and water pressure all are important factors affecting the efficiency of dish-

washing machine operation. The necessary pump capacity for dishwashing machines is determined by the volume of water, time of treatment, nozzle size and pressure at the nozzles for each of the operations in the various types of machines. All of these important factors must be considered.

For water heating systems having very small storage capacity (such as in the coils in a steam boiler or in an instantaneous heater), the maximum gallon per minute (gpm) hot water flow rate demanded by the machines must be known. For the typical storage system (having a moderate amount of storage and sufficient heated capacity to recover completely between meals), the *maximum hourly flow* must be known, and the number of hours during which this flow continues. These figures are important.

Door Type Dishwashing Machines

This type machine, Fig. 1, consists of a tank containing hot wash water and detergent which is recirculated by a motor-driven pump through spray nozzles. Water consumption is based on rack size and water flow pressure. The flow pressure should be not less than 15 pounds per square inch (psi) in the line adjacent to the machine and should be regulated so that it will not exceed 25 psi.

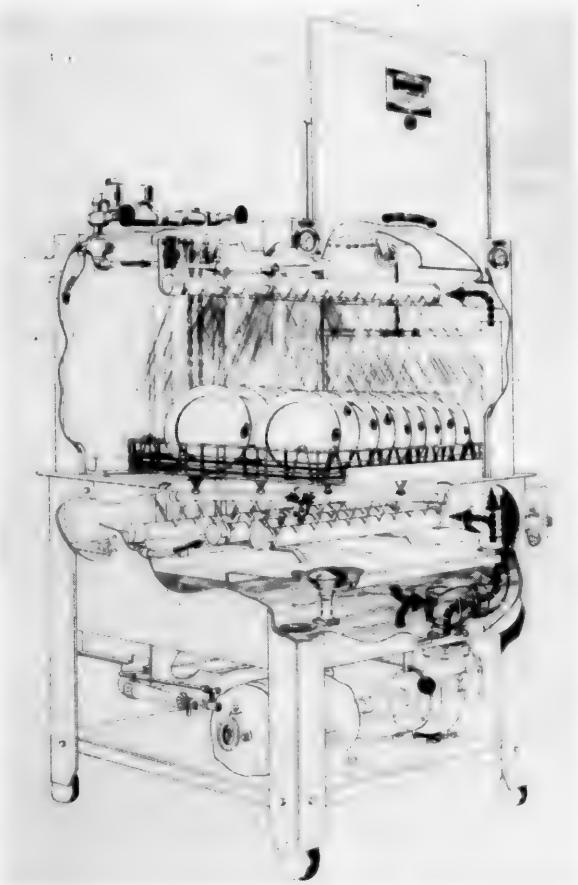

Fig. 1. General arrangement of a door type dishwashing machine

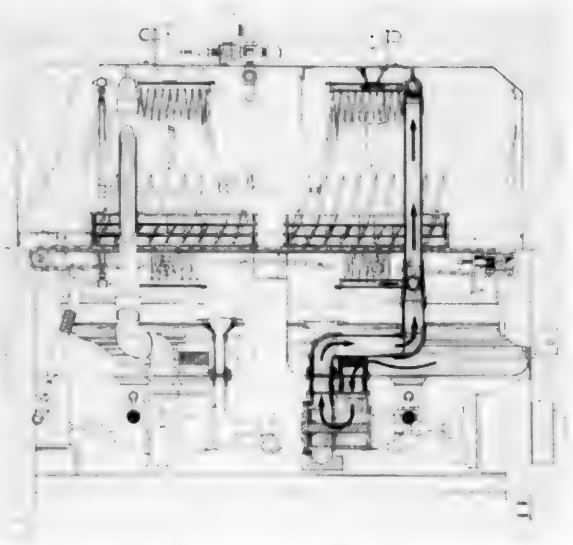

Fig. 2. Multiple tank conveyor type dishwashing machine with dishes inclined

A flow pressure of 20 psi at the machine is considered ideal.

In all instances it must be remembered that the peak hourly demand of hot water will include the initial tank filling volume of 140 deg water plus the 180 deg rinse water requirements. Manufacturers' catalogs should be consulted for tank capacities.

The hourly 180 deg rinse water needs can be quickly determined by referring to Table 1. These figures are based on the National Sanitation Foundation recommended 10-second rinse requirement.

Conveyor Type Dishwashing Machines

A conveyor dishwasher, Figs. 2 and 3, is one with open ends through which dishes are fed either in racks or on a conveyor belt; dishes are automatically passed through at least a wash cycle and a final fresh water rinse cycle.

Two-temperature hot water is needed—140 deg water for washing and 180 deg water for rinsing. One can determine 140 deg wash water usage by the amount required to fill the wash tanks at the beginning of the meal period. This is the number of tanks multiplied by tank capacity. For example, a multiple-tank machine of three average tanks requiring 20 gal each would require 60 gal of 140 deg water for the initial fill. Manufacturers' catalogs should be consulted for tank capacities.

Usage of 180 deg rinse water may be determined by accurately identifying the type of conveyor dishwasher being used. There are three basic types of conveyor machines which may be identified as follows:

1. Single tank (one wash tank with dishes conveyed through the machine in rack).

2. Multiple-tank, dishes inclined (two or more wash tanks with dishes conveyed through machine in racks or on conveyor belt).

3. Multiple-tank, dishes flat (two or more wash tanks

TABLE 1—RINSE WATER (180 DEG F) REQUIREMENTS FOR DISHWASHERS

(Flow pressure at dishwashers assumed to be 20 psi)

Type and Size of Dishwasher	Flow Rate, gpm	Requirements in gallons per hour at 180 deg, based on gpm rate to be used in conjunction with heaters having no internal storage	Requirements in gallons per hour at 180 deg, to be used when sizing heaters having sufficient internal storage to meet the gpm flow demand*
Door type, 16 x 16 in. rack	6.94	416	69
18 x 18 in. rack	8.67	520	87
20 x 20 in. rack	10.4	624	104
undercounter type	5	300	70
Conveyor type, single tank	6.94	416	416
multiple tank (dishes flat)	5.78	347	347
multiple tank (dishes inclined)	4.62	277	277
Silver washers	7	420	45
Utensil washers	8	480	75
Make-up water requirements	2.31	139	139

* Dishwasher operation at 100% mechanical capacity.

TABLE 2—GENERAL PURPOSE HOT WATER CONSUMPTION GUIDE FOR VARIOUS KITCHEN USAGES

(Dishwasher operation at 100% mechanical capacity. Supply water pressure to machines assumed to be 20 psi)

Application	Consumption, Gallons Per Hour
Vegetable sink	45
Single pot sink	30
Double pot sink	60
Triple pot sink	90
Pre-scrapper (open type)	180
Pre-flush (hand operated)	45
Pre-flush (closed type)	240
Recirculating pre-flush	40
Bar sink	30
Lavatories (each)	5

with dishes conveyed through machine on conveyor belt).

Data on sizing, discussed later, were prepared to calculate quickly the correct size of gas water heater required to supply the amount of two-temperature water, *as determined from Tables 1 and 2*, for these conveyor applications.

Under-counter Door Machines with Pump Rinse

These machines are primarily used for glass washing but may be used for general dishwashing in smaller establishments. Their identifying feature is a forced pump wash and pump rinse rather than a line pressure rinse. They require 180 deg water for both wash and rinse—4⅔ gal per load. The maximum number of loads per hour is 15. However, in computing the hot water requirements, 70% of this figure may be used since the machine will probably not be operated faster than this rate.

Silver Washers

The 180 deg water requirements on these machines are almost standard, requiring approximately 45 gallons per hour at 100% operating capacity. See Table 1.

Utensil Washers

These machines are similar to door type dishwashers in their operation. They have solid doors and a maximum 180 deg water requirement of 75 gallons per hour. See Table 1. The wash tank 140 deg water capacity is approximately 85 gal.

Make-up Water

On some multiple tank conveyor type machines an optional device may be provided to supply additional wash water to the wash tanks. The purpose of this water, obtained from the 180 deg rinse line, is to maintain a desired level and to run off any grease which may be present. This make-up water must be included when determining the 180 deg water requirements of those machines employing this device. See Table 1.

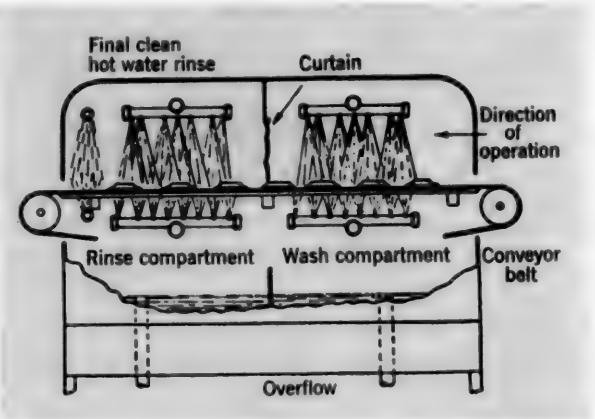

Fig. 3. In this multiple tank conveyor type dishwashing machine the dishes are laid flat

Preflushing

There are two general styles of preflush, (1) the fresh water preflush and (2) the recirculating preflush. The fresh water preflush is fundamentally nothing more than a rinse arrangement put on the front end of the machine to remove some of the gross soil from the dish and decrease the soil load in the wash tank. Fresh water preflushes, both hand operated and mechanical, have a water consumption of approximately 4 gpm or 240 gallons per hour, taken from the general purpose hot water supply. However, the average working capacity of 70% is general practice and, therefore, one could figure on a fresh water preflush consumption of approximately 168 gph of 120 deg water.

The recirculating preflush is a contrast to the fresh water method in that it has an additional pump for recirculating the preflush water. Most machines use the overflow from the wash tank in the basic machine to supply the water for the recirculating preflush. Approximately 20 gallons of 120 deg water are required for each filling of the wash tank. Tanks are generally filled twice per hour.

Pre-scrapping

Pre-scrappers use high velocity, 110 deg water for removing food particles before the washing operation. Water consumption is approximately 180 gallons per hour (3 gpm).

Immersion Type Dishwashing Machines

These are units consisting of two or more compartments, Fig. 4, in which the racked dishes are immersed and washing is accomplished by forced circulation of the water. General purpose hot water is used to fill the compartments and then the water is heated to 180 deg by the gas burner or burners beneath the unit. Since these machines are often insulated, the heat required to maintain proper temperatures is less than for the ordinary hand sink.

If there is no general purpose hot water supply, this hot water supply can be furnished by an automatic gas water heater.

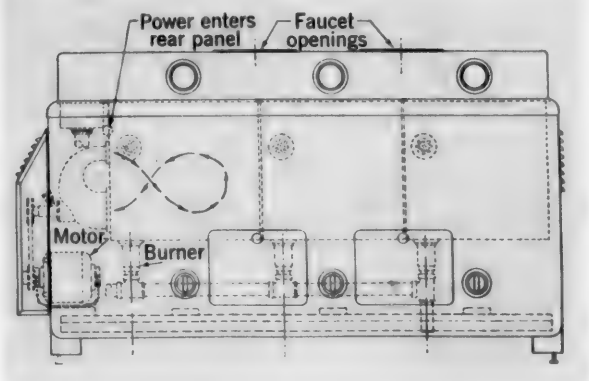

Fig. 4. Immersion type dishwasher in which washing is by forced circulation of water

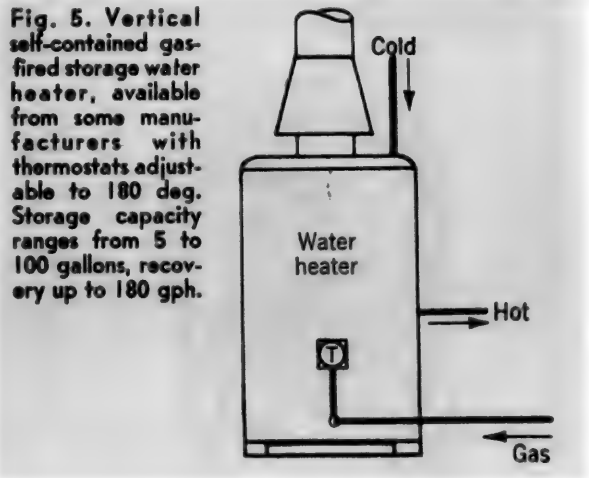

Fig. 5. Vertical self-contained gas-fired storage water heater, available from some manufacturers with thermostats adjustable to 180 deg. Storage capacity ranges from 5 to 100 gallons, recovery up to 180 gph.

The general purpose hot water required per hour, when the unit is in use, may be assumed to equal three times its total capacity. To determine this capacity, multiply the length by the width by the depth of water to obtain the volume of water in cubic inches. Divide this volume

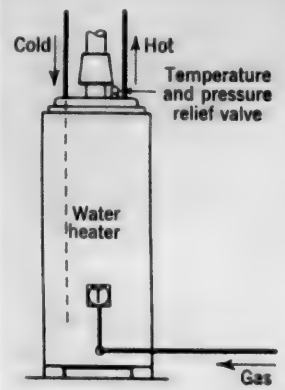

Fig. 6. Instantaneous gas water heater. Recovery rate is up to 10 gallons per minute. Approximately ⅔ gallon of water is in the coils

by 231 to get the number of gallons of water to fill the unit.

Hand Dishwashing Sinks

General purpose hot water is necessary when the sink dishwashing method is used; 180 deg water is also needed in a second sink for rinsing and sanitizing. In some areas, the two or three-compartment sink method is approved.

Past practice has been to install gas burners under the 180 deg compartment. Input of the burners would vary widely with the dish load and size of the compartment. A more efficient method is to supply the hot water by means of a properly sized automatic storage water heater.

TYPES OF WATER HEATERS

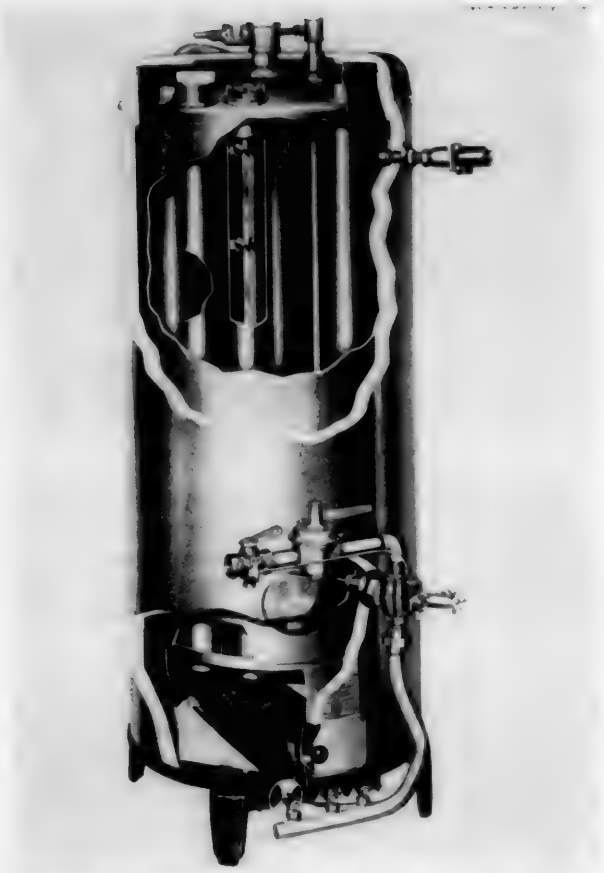

Fig. 7. Circulating tank type gas water heater. Storage capacity is from 100 to 5000 gallons, recovery rate up to 385 gph.

The six basic types of water heating equipment are described below. The Btu input requirements, used as a basis for sizing these water heaters, are obtained from the Master Sizing Guide, Table 3 on page 78. For this, water pressure is assumed to be 20 psi.

Heaters may be rated, however, in terms of their ability to heat water. This rating, the heater recovery capacity, is given in terms of gallons per hour heated through a 100 deg temperature rise.

Self-contained Storage Type Water Heaters

Automatic, storage water heaters, Fig. 5, are self-contained units, requiring no separate external tanks. They heat and store water at thermostatically controlled temperatures for delivery on demand.

Automatic Instantaneous Type Water Heaters

These heaters, Fig. 6, are designed to heat the water as it is drawn through the heater. They are automatic self-contained thermostatically controlled units, requiring no external storage tank, which supply hot water for immediate use upon a water demand at a rated flow or less.

Circulating Tank Type Water Heaters

Water heaters of this type, Fig. 7, furnish hot water to be stored in a separate vessel. Storage tank temperatures are controlled by means of a thermostat installed on the water heater. Circulation may be either gravity or forced.

Steam Boiler and Storage Tank

In one type, Fig. 8, a steam boiler supplies steam to a coil in the hot water storage tank. The tank, coil, and boiler are available in any desired capacity. It is particularly necessary with this type of equipment to study the available space and the allowable floor loadings. Figure 9 shows a similar system using a water coil in the steam boiler.

Steam Boiler with Submerged Coils for Instantaneous Water Heating

In this arrangement (Fig. 10), the entire output of the steam boiler is used for water heating. The gas input to the steam boiler is selected to match the maximum hourly hot water demand. The water heating coil is must larger than this, being adequate to meet the requirements of the maximum minute. A common design figure is to take one square foot of copper coil area for each 15,000 Btu per hour to be transmitted.

Even if no storage tank is provided, as in Fig. 10, the characteristics of the system itself produce an effect of hot water storage. Sudden heavy demands of brief duration may be met through the hot water stored within the boiler and coil. These units when used without a storage tank should be considered as gallon per *minute*

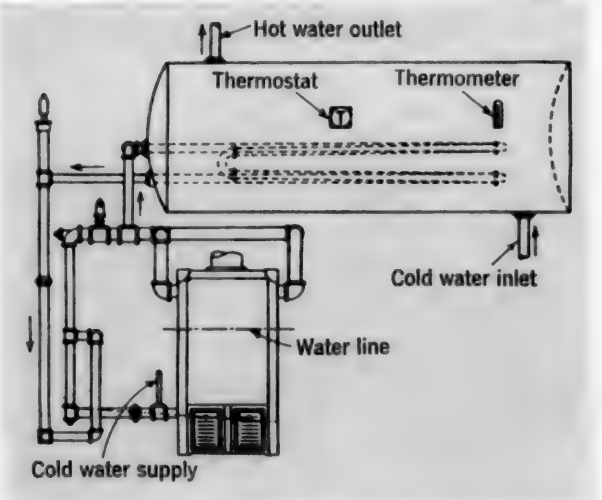

Fig. 8. Indirect storage water heater. Steam from a separate boiler flows through coils of water heater

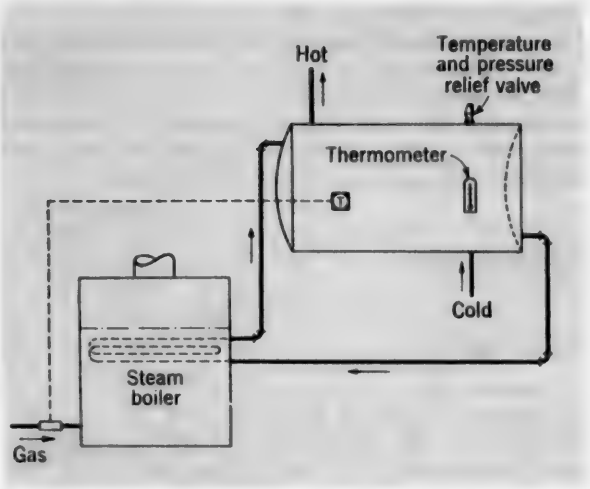

Fig. 9. In this arrangement, the coils are in the steam boiler; heated water from the coils is stored in the tank

heaters. Care should be given to sizing particularly when the unit is used to provide both 140 and 180 deg water. Coil and heater sizing should be based on the maximum total gpm draw of both general purpose and 180 deg rinse water.

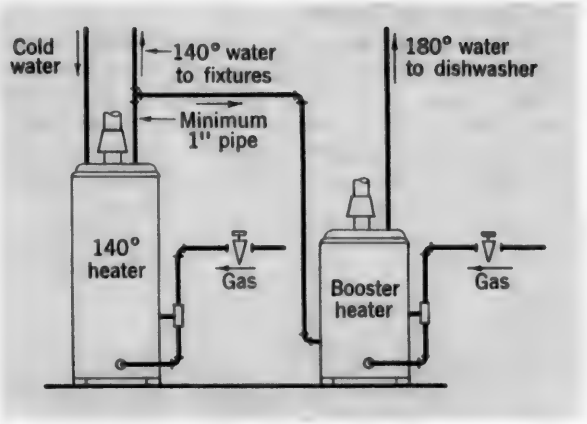

Fig. 11. Booster heater which raises 140 deg water from one heater to 180 deg for rinsing

Booster Heaters

These heaters (Fig. 11) may be of the instantaneous type or automatic storage type. They are used to boost the temperature of primary water to 180 deg sanitizing rinse water temperature in commercial dishwashing machines.

TYPES OF WATER HEATING SYSTEMS

There are three basic arrangements of water heating equipment for providing both 140 and 180 deg water.

Separate Heater System

This arrangement, Fig. 12, is logical when an establishment has 140 deg water supplies adequate for the purpose, but unable to carry additional load. 180 deg water may then be furnished by a separate heater which is supplied with cold water.

Booster Heater System

Booster heaters may be used as shown in Fig. 11 when there is an existing primary hot water system capable of supplying additional hot water other than that required for dishwashing. In such a case, these booster heaters may be supplied with hot water from the primary system to raise the temperature to 180 deg.

Booster heaters of any type can be eliminated by the installation of an adequate dual temperature system with return circulation. The cost of return lines are normally less than the cost of a booster. Small low cost pumps are made by various manufacturers for this purpose.

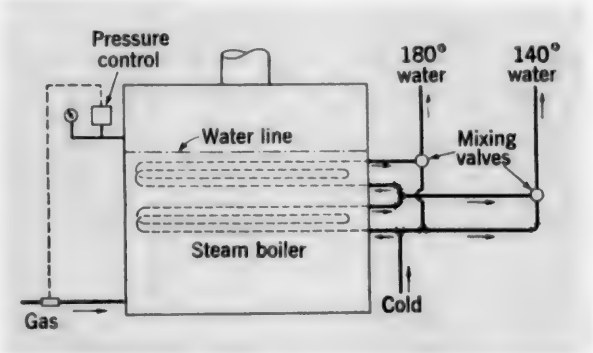

Fig. 10. A steam boiler used solely for instantaneous water heating and supplying water at both 140 and 180 deg.

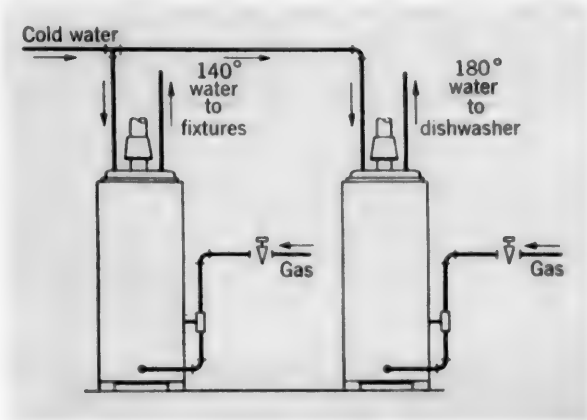

Fig. 12. In this arrangement one heater supplies 180 deg water, another 140 deg water

Dual Temperature Systems

By using a temperature proportioning valve, both 140 and 180 deg water can be produced from an automatic storage system, as in Fig. 13. Installing these water heaters singly or in multiples with balanced piping, adequate flow and temperature can be produced to serve practically all food service dual temperature requirements for the hot water load.

Another system (patented) consists of a heater connected to a separate storage tank in which general purpose hot water (140 deg) is stored. See Fig. 14. The heater also serves as a booster for the 180 deg water demand—drawing water from the 140 deg water tank and heating it as the sanitizing rinse is drawn.

INSTALLATION REQUIREMENTS

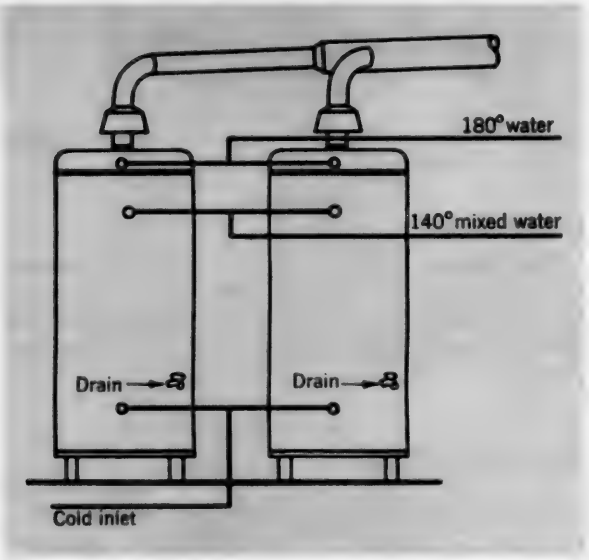

Fig. 13. A multiple heater arrangement giving two temperature water, the highest temperature being drawn from the top of the tank

Water Piping

Adequate water piping is necessary to assure that the recommended pressures are available at the appliances. Table 2 is of value in estimating the general purpose hot water requirements of a food service establishment for pipe sizing.

Refer to the American Standards Association (ASA) National Plumbing Code for correct water piping installation practice.

For trouble free operations, the following installation rules should be followed:

1. The 180 deg water feed line from the water heater to the dishwasher should not be less than ¾ inch I.D. pipe size.
2. There should be no auxiliary feed lines attached to the 180 deg supply line to the dishwasher.
3. A return line should be installed when the water heater is more than 5 feet from the dishwasher. Gravity return is permitted if the water heater is installed at a lower level than the dishwasher and the return flow is not greater than 60 feet. With gravity circulation employed, the piping should be

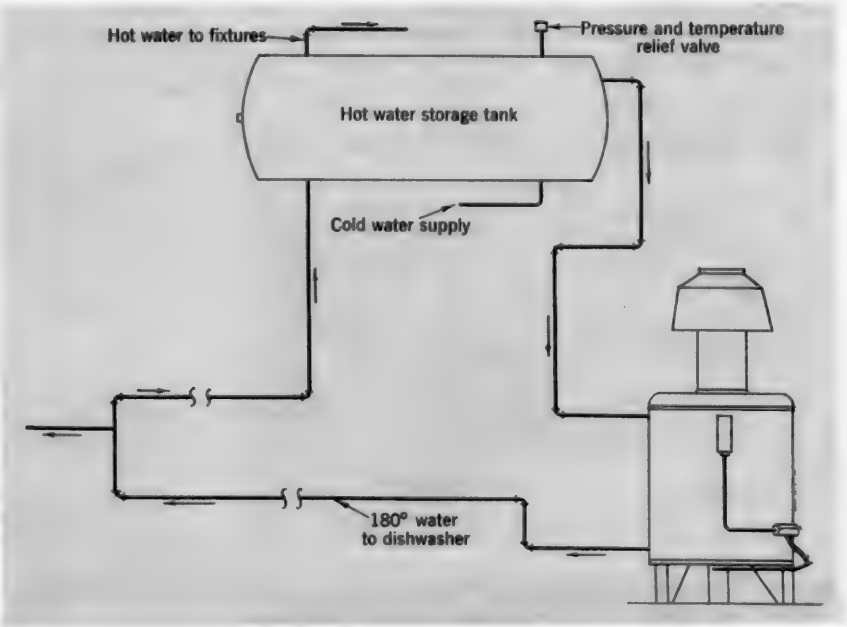
Hot water to fixtures
Pressure and temperature relief valve
Hot water storage tank
Cold water supply
180° water to dishwasher

Fig. 14. A two temperature system with the 180 deg water supplied directly from the heater. 140 deg water for fixtures is drawn off the top of the storage tank

so installed that the feed and return lines are not trapped.

4. Forced circulation by pump should be used when the water heater is installed on the same level as the dishwasher, when the length of the return line is greater than 60 feet, or when the water lines are trapped.
5. When a circulating pump is installed in the return line it may be controlled by: (a) the dishwasher wash switch; (b) a manually operated switch adjacent to the dishwasher; (c) by aquastat built as an integral part of the pump, or (d) by the aquastat in the return line adjacent to the pump.
6. A water pressure reducing valve should be installed adjacent to the dishwasher, external of the recirculating loop.
7. A check valve should be installed adjacent to the heater in the return circulating line.
8. A water pressure gage and thermometer should be installed in the 180 deg water line adjacent to the dishwasher.
9. Cold water feed line to the water heater should never be less than 1 inch I.D. pipe size. For engineering data on proper pipe sizing, refer to the A.S.A. National Plumbing Code.
10. An American Society of Mechanical Engineers (ASME) Approved temperature and pressure relief valve or an approved energy cut-off should be installed in the heater opening furnished by the manufacturer or as close to the hot water outlet as possible. (Consult local code requirements).
11. If a check valve type water meter is installed in the cold line ahead of the water heater, it will be necessary to install an operating pressure relief valve between the water meter and the water heater. The operating relief should be set at a pressure lower than the ASME safety valve mounted on the water heater.

Water Pressure

Accurate and efficient dishwashing operation can be achieved only when the proper water flow pressure is maintained. The National Sanitation Foundation Standards for dishwasher water flow pressures are as follows:

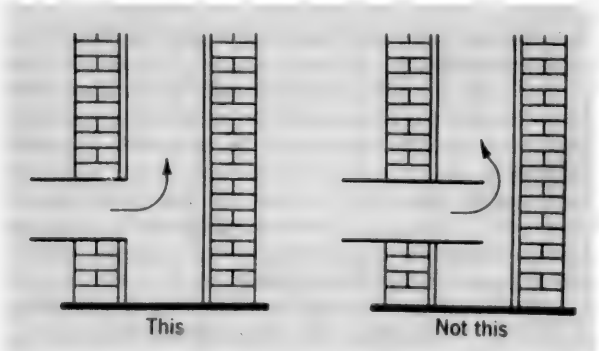

Fig. 15. The end of the flue pipe should be flush with the chimney lining as at left, not as shown at right

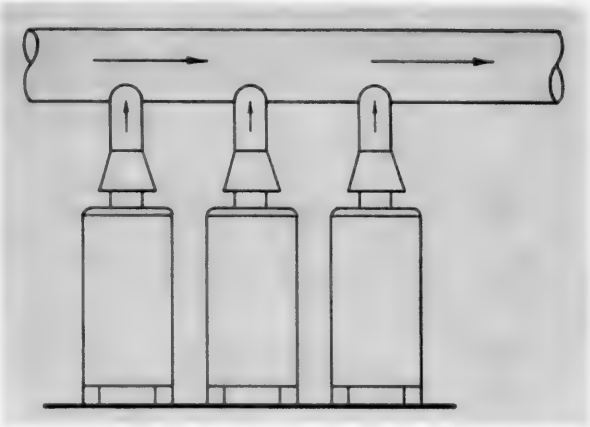

Fig. 16. Where more than one heater is connected to a common vent, the area of the large pipe should equal the area of the largest inlet plus one half the combined areas of the other appliances

15 psi minimum flow pressure, 25 psi maximum flow pressure and 20 psi for ideal operation. The sizing guides presented with this material are based on 20 psi flow pressure.

Water flow pressure should not be confused with the static water pressure. Static pressure is the measurement of water line pressure with no water flowing. Water flow pressure is the measurement of pressure with water flowing through the rinse arms of the dishwasher. Low water flow pressure can be caused by: (a) undersized water lines; (b) stoppage on old water lines; or (c) excessive pressure drop through the water heaters.

Low water pressures produce an inadequate 180 deg rinse resulting in poor air drying and sanitizing of dishes. In instances where flow pressure in the line at the dishwashing machine is below 15 psi, an adequate booster pump should be installed.

High water flow pressures in excess of 25 psi will atomize the 180 deg rinse and create an excessive temperature loss to the air; a loss of 15 deg can occur between the rinse nozzle and the dish rack area.

A water pressure regulator approved for 180 deg operation should be installed in the rinse line adjacent to the dishwasher and external of the return circulating loop. The water flow pressure setting should be 20 psi.

Gas Piping

Gas piping of adequate size is important to the proper performance of any gas appliance. For correct design and installation of gas piping reference should be made to the A.S.A. code, Z-21.30, and a check made with the local gas company.

Venting

Water heating equipment should be vent connected or provided with other means for exhausting the flue gases to the outside atmosphere. Not that for correct design and specific practices, references should be made to A.S.A. code, Z-21.30 and local ordinances.

The vent connector between the heater and vertical

TABLE 3—MASTER SIZING GUIDE FOR DETERMINING GAS INPUT FOR HEATING VARIOUS WATER QUANTITIES THROUGH VARIOUS TEMPERATURE RISES

(Supply water pressure assumed to be 20 psi)

Water Requirements, gph	Temperature Rise, Deg F										
	40	50	60	70	80	90	100	110	120	130	140
	Gas Input Required, Btu per Hour										
25	12	15	18	21	24	27	30	33	36	39	42
50	24	30	36	42	48	54	60	66	72	78	84
75	36	45	54	63	72	81	90	99	108	117	126
100	48	60	72	84	96	108	120	132	144	156	168
125	60	75	90	105	120	135	150	165	180	195	210
150	72	90	108	126	144	162	180	198	216	234	252
175	84	105	126	147	168	189	210	231	252	273	294
200	96	120	144	168	192	216	240	264	288	312	336
225	108	135	162	189	216	243	270	297	324	351	378
250	120	150	180	210	240	270	300	330	360	390	420
275	132	165	198	231	264	297	330	363	396	429	462
300	144	180	216	252	288	324	360	396	432	468	504
325	156	195	234	273	312	351	390	429	468	507	546
350	168	210	252	294	336	378	420	462	504	546	588
375	180	225	270	315	360	405	450	495	540	585	630
400	192	240	288	336	384	432	480	528	576	624	672
425	204	255	306	357	408	459	510	561	612	663	714
450	216	270	324	378	432	486	540	594	648	702	756
475	228	285	342	399	456	513	570	627	684	741	798
500	240	300	360	420	480	540	600	660	720	780	840
525	252	315	378	441	504	567	630	693	756	819	882
550	264	330	396	462	528	594	660	726	792	858	924
575	276	345	414	483	552	621	690	759	828	897	966
600	288	360	432	504	576	648	720	792	864	936	1008
650	312	390	468	546	624	702	780	858	936	1014	1092
700	336	420	504	588	672	756	840	924	1008	1092	1176
750	360	450	540	630	720	810	900	990	1080	1170	1260
800	384	480	576	672	768	864	960	1056	1152	1248	1344
850	408	510	612	714	816	918	1020	1122	1224	1326	1428
900	432	540	648	756	864	972	1080	1188	1296	1404	1512
950	456	570	684	798	912	1026	1140	1254	1368	1482	1596
1000	480	600	720	840	960	1080	1200	1320	1440	1560	1680

flue or vent should be the same size as the outlet of the draft hood supplied with the heater. The vertical flue or vent should be sized in accordance with Figure 7 of A.S.A. code Z-31.30.

When existing chimneys are used, an examination of the chimney flue should first be made to see that it is clear and unobstructed.

Vent connectors between the appliance and the vertical gas vent or chimney should have the greatest possible initial rise consistent with the headroom available in the appliance area, and required clearance to combustible material. When vent connectors are attached directly to side outlet drafthoods, they shall be pitched upward at least ¼ inch per foot. No portion of any vent connector shall be run downward nor shall there be any sags or dips.

The horizontal run of the vent connector shall be as short as possible and the appliance shall be located as near the gas vent or chimney as practicable. The maximum length of an uninsulated horizontal run of vent connector shall not exceed 75 percent of the height of the gas vent or chimney.

The connection of the flue pipe to the chimney should always be made with the end of the pipe flush with the interior surface of the chimney lining. See Fig. 15.

A gas appliance vent connector and a flue connector from an appliance burning another fuel may be connected into the same chimney through separate openings, or may be connected through a single opening if joined by a suitable fitting located as close as practicable to the chimney. If two or more openings are provided into one chimney, they should be at different levels. No damper should be placed in any flue connection between the water heater and the drafthood nor, except for fixed dampers, between the drafthood and chimney.

A chimney cleanout door is a valuable addition if it can be provided.

When the flue pipe passes near wood or other combustible material, they should be protected by suitable insulation or be constructed as required by local ordinance.

Vent connectors shall be securely supported for the weight and design of the materials employed to maintain proper clearances, to prevent physical damage, and to prevent separation of the joints.

A flue connection through the side wall of a building or through a window, regardless of the type of cap used on the end of the vent pipe, will not provide satisfactory venting. This type of flue connection must not be used.

When several appliances are to be connected to a single vent pipe, as in Fig. 16, the area of the main vent pipe should equal the area of the largest vent in addition to half the area of additional appliances connected.

Water heaters installed in kitchens equipped with proper ventilation should be vented as shown in Fig. 17, to prevent the suction at the hood from causing a backdraft at the water heater.

Where venting presents a problem, such as the unavailability of a chimney, and gas is still the desired fuel the use of mechanical venting or draft inducers can be employed. Manufacturers' literature should be consulted for installation instructions of such devices with their water heating equipment.

Air for Combustion

Appliances shall be installed in a location in which the facilities for ventilation permit satisfactory combustion of gas, proper venting and the maintenance of ambient temperature at safe limits under normal conditions of use. Appliances shall be located in such a manner as not to interfere with proper circulation of air within the confined space. Where buildings are so tight that normal infiltration does not meet air requirements, outside air must be introduced. This may be accomplished by providing openings into the heated space or directly into the equipment space or into a return air duct of a forced air heating system. For specific applications, reference is made to A.S.A. code Z21.30.

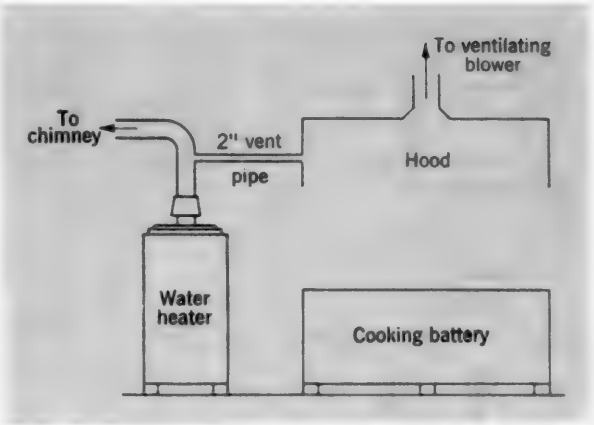

Fig. 17. Method of venting exhaust hoods in kitchens to prevent backdraft at the water heater

Clearances

Underfired, insulated automatic storage water heaters approved by the American Gas Association Laboratories should have a minimum clearance to the nearest wall of two inches, except for those specifically approved for flush to wall installation. Other types of A.G.A. approved water heaters, such as circulating tank and instantaneous types, and A.G.A. approved steam boilers, should have a minimum clearance of six inches. Reference is made to A.S.A. code Z21.30 for specific applications.

CHOICE OF EQUIPMENT AND SYSTEMS

The choice among various adequate systems will probably be dictated chiefly by space limitations, the first cost of the equipment, the expected life of the equipment and servicing costs. In most cases, there will probably be little difference in operating costs among the various correctly sized combinations.

Sizing

The objective of the following text is to permit the intelligent selection of a hot water heater designed to meet all the hot water requirements, both general purpose and 180 deg rinse water. It is assumed that the selection of a dishwashing machine has been made so that the argument of entry for Table 1 is the type of dishwasher. In order to make use of the Master Sizing Guide, Table 3, to determine the total hot water requirements, it is first necessary to calculate the general purpose hot water requirements using the Water Consumption Guide, Table 2.

Table 3 provides for continuous operation on both water temperatures as well as for an assumed peak period operation. It indicates the total required gas fuel input which may be met by one or more heaters.

Where adequate storage tanks are used in conjunction with the water heating equipment, smaller input heaters can generally be used, providing there is a definite peak hour or hours of hot water demand and the heater has sufficient input to recover completely between peak demand periods. Under these conditions the hot water available in the storage tank may be used to meet the peak demand and, consequently, the recovery capacity of the water heater may be less than would be required for an instantaneous type heater. While smaller input heaters therefore could be used with storage tank systems, it is conceivable that the added cost of the storage tank and its associated plumbing might make the selection of such systems undesirable. Recovery of hot water in the storage tank occurs during the off-peak hours when the dishwashing equipment is either not in use or only operated at a rate well below 70% of capacity which is all that is normally attained except for rackless-type conveyor machines.

The Master Sizing Guide, Table 3, is used to size the required heater or heaters after allowance has been made for the quantity of hot water that may be withdrawn from the storage tank each hour.

To determine the gallons per hour of usable hot water from storage, the duration in hours of consecutive peak demand must be determined. This peak demand will usually coincide with the dishwashing period during and

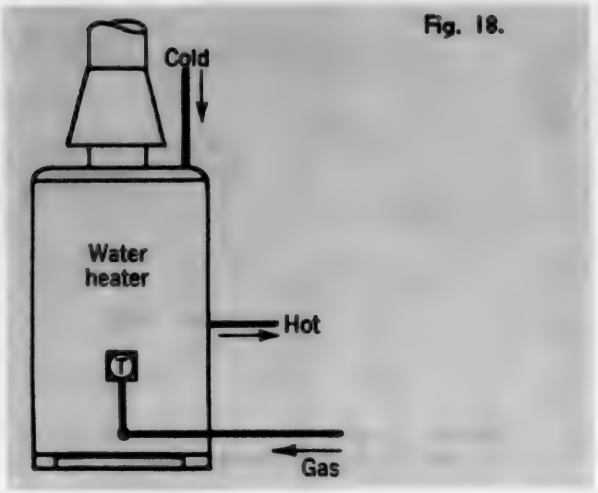

Fig. 18.

after the main meal and may last for 1, 2, 3, or more hours. Any hour in which the dishwasher is used at 70% of mechanical capacity or more should be considered as a peak hour. If the peak demand period lasts 4 hours or more, the value of a storage tank is small, unless extremely large sizes are used. In such cases the use of instantaneous heaters are indicated.

Automatic storage water heaters with storage capacities up to 100 gallons should be sized on the basis of the maximum hourly demand, with the storage capacity being used as an extra capacity factor in the heater.

The following method of making allowances for the water in storage, should be used only when sizing heaters and systems with more than 100 gallon storage capacities.

Usable hot water from storage is calculated from the following formula:

Usable hot water from storage, gph = [0.7 × capacity of tank in gallons] ÷ duration of peak hot water demand in hours.

(The 0.7 factor has been experimentally determined to be the maximum usable general purpose hot water available from a storage tank after allowance for dilution with cold inlet water, assuming the inlet and outlet connections have been properly designed and located for the work.)

Where a storage tank is used, the required 180 or 140 deg water usage which must be supplied by the water heater is determined as follows. This net figure is used for entering Table 3.

Net hot water required, gph = total hot water required, gph — usable hot water from storage in gph.

The National Sanitation Standard No. 5 recommendations for hot water rinse demand are based on 100% mechanical operating capacity of the machines. The data provided on Table 1 is also based on 100% operating capacity. However, it is generally recognized by industry, and is so stated by N.S.F. Standard No. 5, that 70% of operating rinse capacity is all that is normally attained except for rackless-type conveyor machines.

Therefore, in order to correctly size a water heating system it is necessary to know:

(1) Types and sizes of dishwashers used.
(2) Required quantity of general purpose hot water (manufacturers' catalogs should be consulted to determine the initial fill requirements of the wash tanks.)
(3) Duration of peak hot water demand period.
(4) Inlet water temperature.
(5) Type and capacity of existing water heating system.
(6) Type of water heating system desired.

The following examples are used to demonstrate the use of the tables.

Problem 1

Determine the gas-fuel input requirements necessary to correctly size a new water heating system for meeting the hot water demands of a cafeteria. The maximum number of consecutive hours the dishwasher is used at near 70% capacity is assumed to be 2 hours. The supply water temperature is 60 deg and the load consists of the following:

Use	General Purpose Hot Water Consumption (From Table 2) gph @ 140 deg	100 deg Water Consumption When Dishwasher is Operated at 100% of Mechanical Capacity (From Table 1) gph @ 180 deg
1—Vegetable sink	45	—
5—Lavatories	25	—
1—Pre-scrapper	180	—
1—Two tank conveyor dishwasher (dishes inclined) with make-up device	—	277
Initial fill of tanks = 2 x 20 Gal =	40	—
Make-up water	—	139
1—Utensil washer	—	75
Initial fill of tank =	85	—
Total requirements =	375 gph of 140 deg water	491 gph of 180 deg water

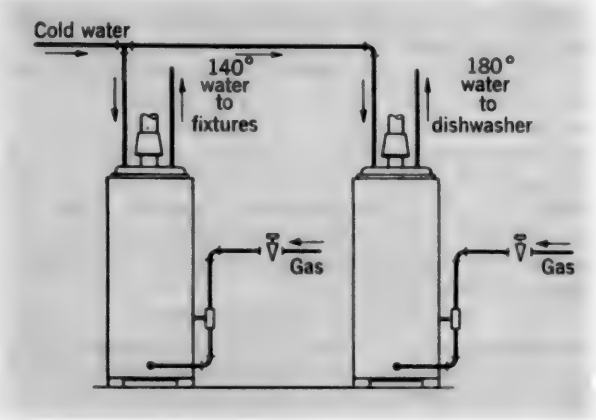

Fig. 19.

The hot water demands of this cafeteria can be met by the application of any one of the many systems discussed. While five solutions are shown to demonstrate the use of the tables, the reader should not feel that they are the only possible solutions or necessarily the best ones.

After the total general purpose, 140 deg water and 180 deg rinse water consumptions have been determined from Tables 1 and 2 and the National Sanitation Foundation Recommendation, that the machines will probably be operating at only 70% of full mechanical operating capacity has been applied, Table 3 is entered.

In all solutions to the foregoing problem, the total 140 deg water consumption used is 375 gph. The 180 deg water consumption used is 350 gph (70% of 491 gph = 344 gph) for those heaters having sufficient internal storage capacity to meet the gallon per minute flow demand. For instantaneous type heaters, having no internal storage capacity, the 180 deg water consumption used must be based upon the gpm flow demand and is 900 gph. This consumption, obtained from Table 1, is as follows:

Use	180 deg Rinse Water Hourly Consumption Based Upon GPM Flow Rate
Dishwasher	277 gph
Make-up	139 gph
Utensil washer	480 gph
	Total = 896 gph of 180 deg water (use 900 gph)

The water must be heated over a temperature rise of 80 deg to produce 140 deg water from 60 deg inlet water and over a temperature rise of 120 deg to produce 180 deg water from the 60 deg inlet water.

Solution A

To meet the hot water requirements of the cafeteria with separate self-contained storage type heaters such as those shown in Fig. 18:

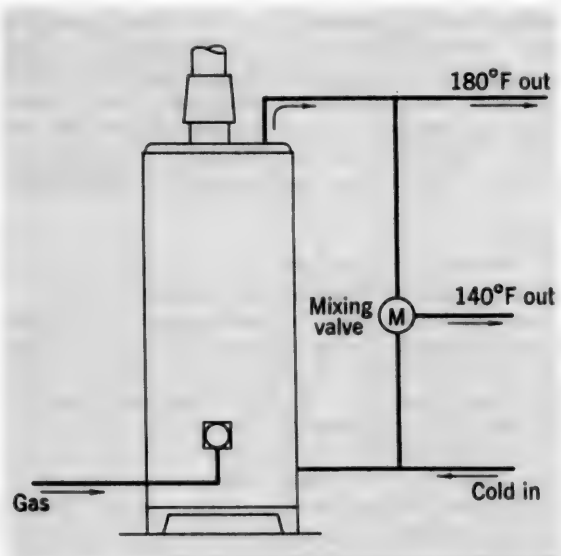

Fig. 20. Instantaneous gas water heater to produce two temperature water

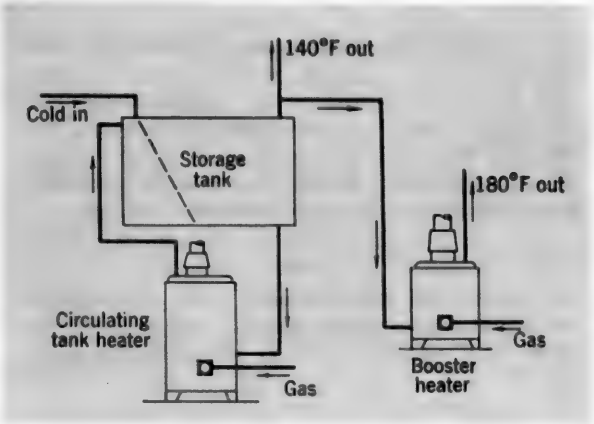

Fig. 21. A circulating tank heater with external storage to supply 140 deg water for general purposes and a booster heater to produce 180 deg water

First, to determine the gas input requirements to produce the 140 deg water, the left column of Table 3 is entered at 375 gal per hr. and read horizontally across to the 80 deg temperature rise column. The figure, 360,000 Btu per hr. at the intersection of these two columns is the heater requirement. One or more heaters with this total Btu requirement may now be selected from manufacturers' catalogs.

To determine the gas input requirements for the heater which will produce the 180 deg water, enter the left column of Table 3 at 350 gal per hr. and read across to the 120 deg temperature rise column. The figure 504,000 Btu per hr. at the intersection of these two columns is the heater requirement. One or more heaters with this total Btu requirement may now be selected from manufacturers' catalogs.

Fig. 19 shows the application of separate heaters for the production of 140 deg water and 180 deg water.

Solution B

To meet the hot water requirements of the cafeteria with an instantaneous type heater, having no internal storage, to supply both the 140 and 180 deg water: This installation is shown in Fig 20.

The correct sizing of instantaneous type heaters is dependent upon the gallon per minute flow rate of this 180 deg rinse water. Both the hourly 180 deg water consumption based upon the gpm flow rate and the hourly consumption of 140 deg water can be obtained from Tables 1 and 2.

Entering Table 3 in the left hand column with the total 180 deg water requirement of 900 gph and reading across to the intersection with the vertical column headed 120 deg temperature rise, the gas input requirement of 1,296,000 Btu per hr. is obtained. To obtain the total heater requirement, the gas input needed to produce the total 140 deg water, from a 60 deg inlet supply, must be added. This second figure is also obtained from Table 3 by entering the left hand column at 375 gph and reading,

across to the 80 deg temperature rise column, the figure 360,000 Btu per hr.

The total heater requirement; equal to the sum of 1,296,000 Btu per hr. plus 360,000 Btu per hr. is 1,656,000 Btu per hr.

One or more heaters meeting this total Btu requirement may now be selected from manufacturers' catalogs.

Solution C

To meet the hot water demands of the cafeteria with separate instantaneous type heaters, having no internal storage. This installation will be similar to that shown in Fig 19.

The gas input requirements of these separate heaters are equal to those needed to produce the 140 deg water and the 180 deg water as shown in Solution B. These requirements are 360,000 Btu per hr. to produce 140 deg water, and 1,296,000 Btu per hr. to produce the 180 deg water.

Separate heaters meeting these total Btu requirements may now be selected from manufacturers' catalogs.

Solution D

To meet the hot water requirements of the cafeteria with; (1) a booster heater having sufficient storage capacity to meet the gallon per minute flow demand, to supply the 180 deg rinse water requirements from a 140 deg supply; and (2) a heater used in conjunction with a 500 gallon external storage tank to supply 140 deg water for both general purpose and the booster heater. This installation is shown in Fig 21.

To size the booster heater, enter the left hand column of Table 3 with the 180 deg water consumption demand of 350 gallons per hour. Read horizontally across to the 40 deg temperature rise column and obtain the needed gas input requirement of 168,000 Btu per hr. A booster heater may now be selected, meeting this Btu requirement, from manufacturers' catalogs.

The net hourly hot water requirement must be determined in order to size the heater required to supply the 140 deg water. The net hot water is determined by the amount of usable hot water in storage.

Usable hot water in storage (gph) = (500 gal $\times$ 0.7 $\div$ 2 hr. (peak dishwashing period) = 175 gph

Net hot water required, gph = 725 gph — 175 gph = 550 gph.

The gas input requirement can now be determined from Table 3 by entering the left hand column at 550 gph, reading across to the 80 deg temperature rise column and obtaining the figure of 528,000 Btu per hr. A heater may now be selected from manufacturers' catalogs. In the solutions using storage tanks, it will be assumed that the water in these tanks will have been brought up to temperature previous to the peak dishwashing period and sufficient time elapses before the next peak period for the water in the storage tank to recover.

Solution E

To size a single heater with external storage tank for the patented dual temperature system shown in Fig. 14. If a 500 gallon storage tank were to be used, the gas input requirements of this heater would be equal to the total gas requirements of the two heaters sized for Solution D. Since no single heater has this capacity, a heater will be selected first and a storage tank will be sized in order to meet the total hot water requirements.

For this problem, a heater has been selected with an input rating of 420,000 Btu per hr. To determine what amount of this input will be available to produce the 140 deg water, there must be subtracted that input needed to produce the 180 deg water by boosting from 140 deg. The input needed to boost to 180 deg can be obtained by entering Table 3 with 350 gph and reading this input at the 40 deg temperature rise column. The amount of input available to produce 140 deg water is 420,000 Btu per hr. minus 168,000 Btu per hr, and equals 252,000 Btu per hr.

Using Table 3 in the opposite direction, and knowing that the 140 deg water is produced over an 80 deg temperature rise, the net 140 deg water produced by this heater is obtained by entering the vertical column headed 80 deg temperature rise, reading down to the 240,000 Btu per hr. figure (next lower to 252,000 Btu per hr.) and then reading horizontally to the left, the figure 250 gph in the left hand column.

The usable hot water needed from storage equals the total hot water required in gph minus the net hot water in gph.

= 725 gph — 250 gph = 475 gph

The capacity of the storage tank (gallons) equals the usable hot water from storage in gph times the duration of peak hot water demand in hours divided by 0.7. This equals 475 gph $\times$ 2 (hr.) $\div$ 0.7 = 1357 gallons storage. A storage tank having a capacity of 1357 gallons or more must be used.

Problem 2

A luncheonette has just purchased a door type dishwashing machine to handle 16 x 16 inch racks. The existing primary hot water system is capable of supplying sufficient 140 deg general purpose water to meet all the requirements of the establishment plus a booster heater, the sizing of which is to be determined. The booster must heat sufficient 140 deg water to provide the needed 180 deg rinse requirements of the dishwasher.

Solution A

To meet the 180 deg demand of the dishwasher with a booster heater having no storage capacity.

Since the heater is of the instantaneous type, it must be sized to supply the 180 deg water demand at a rated flow. This rated flow, obtained from Table 1 is 6.94 gallons per minute or 416 gallons per hour. Since the temperature rise of the water through the heater is 40 deg (180 deg outlet — 140 deg inlet), the gas fuel input can be found from the Master Sizing Guide, Table 3, by entering the left hand column at 425 gph and reading across to the 40 deg temperature rise column, the gas requirements of 204,000 Btu per hr. A heater may now be selected from manufacturers' catalogs meeting this input requirement.

Solution B

To meet the 180 deg demand of the dishwasher with a booster having sufficient storage capacity to meet the gallon per minute flow demand.

By designing for a booster heater having a small storage capacity, the hourly flow demand of the dishwasher can be used for sizing rather than the gallon per minute rate which was used in Solution A. The flow obtained from Table 1 is 69 gph when the dishwasher is operating at 100% mechanical capacity. However, the National Sanitation Foundation states that 70% of operating rinse capacity is all that is normally attained for this type of machine. Therefore, the hourly flow demand, used as the argument of entry into the Master Sizing Guide, Table 3, is 48 gph. Entering the first column with 50 gph and reading across to the 40 deg rise column, the gas input requirement will be 24,000 Btu per hour. Using this gas input requirement, a booster-heater may be selected after consultation with manufacturers' catalogs.

GLOSSARY

DETERGENT—A cleansing and wetting agent which is suitable for use in spray-type dishwashing machines and which when used effectively aids in the removal of soil from dishes.

DETERGENT DISPENSER—A device for automatically and uniformly adding detergents to wash water so that the optimum concentration of detergents is maintained.

DETERGENT METER—A device for automatically showing whether or not the concentration of detergent in the wash tank is at the desired level.

DEMAND—The *rate* of use of water, gas, or electricity; for example, gallons per minute of hot water.

FINAL RINSE—The last rinse given to the dishes in the dishwashing machine. It is supplied with clean 180 deg water from the water heating system.

PEAK—The maximum, as in *peak* hot water demand.

MAKE-UP WATER—Additional wash water added to wash tank to maintain a desired level, obtained from 180 deg rinse line, normally provided by a device optional on some multiple tank conveyor type machines.

RECOVERY—The ability of a water heater to heat cold water; for example, a heater may be said to have a recovery capacity of 100 gallons of water per hour through 100 deg rise. The temperature rise must always be stated in connection with recovery capacity.

TEMPERATURE RISE—The difference in temperature between the cold water entering the heater and the hot water leaving the heater is defined as the temperature rise of the heater; for example, if cold water enters a heater at 40 deg and the hot water leaves at 140 deg, the heater is said to be operating with 100 deg rise.

WASH SPRAY—The power spray, in a dishwashing machine, which is supplied from the wash tank containing a detergent.

SCRAPPING—Means the removal from dishes of gross particles of food or refuse. The purpose is (1) to prevent the clogging of strainers, scrap trays and nozzles or slots in spray arms; (2) to lessen the amount of organic waste and the number of micro-organisms entering the wash tank; (3) to remove grease which may result in the formation of suds and loss of detergent; (4) to lessen the need for adding fresh water, thus conserving the detergent, and (5) to wet the soil remaining on the dishes so that washing is facilitated. Scrapping may be accomplished by hand or with a high velocity spray.

PRE-FLUSHING—Means rinsing dishes before washing by a stream or spray or fresh or recirculated hot water, generally without detergent added.

LINE (STATIC) PRESSURE—Means the pressure as shown by a gage in the water line when read at a time when all outlets are closed and no water is flowing.

FLOW PRESSURE—Means the pressure as shown by a gage in the water line adjacent to the machine, read at a time when all outlets are open as in operation.

RACKS—This term is applied to the welded wire or wood and wire devices constructed to hold dishes or silverware in proper position for washing.

RACKING—Is the process of placing dishes in specially designed racks in proper positions so that each dish will be fully exposed to unrestricted preflushing, washing and rinsing.

GENERAL PURPOSE HOT WATER—Water that is used for all dishwashing operations except the sanitizing rinses. Unless specified its temperature should be between 110 and 140 deg.

MECHANICAL OPERATING CAPACITY—The capacity at which a dishwashing machine is operated. For door type machines, the maximum operating capacity is approximately 60 racks per hour.

The Fan Laws Simplified

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ENGINEERS are oftentimes called upon to select fans or evaluate the usefulness of existing fans for specific applications. These tasks are best handled by using the well known fan laws.

Air-moving equipment covered by the fan laws includes centrifugal, propeller, tube-axial, and vane-axial fans operated either as blowers or exhausters. The fan laws are restricted to fans of the same shape (or the same fan) operating at the same efficiency on the characteristic curve (*i.e.*, fan pressure versus air flow).

The variables associated with fan operation are flow rate, Q; developed head pressure, H; required power, P; fan diameter or size, D; fan speed, N; and air or gas density, d. By dimensional analysis techniques, the interrelationship between these variables has been established. These are presented in Table 1 as dimensionless groupings.

TABLE 1—INTERRELATIONSHIP OF FAN VARIABLES

Grouping	Variables	Dimensionless Grouping
1	Q, N, D, d	Q/D^3N
2	Q, N, H, d	$Q^2N^4d^2/H^3$
3	Q, N, P, d	$Q^3N^5d^3/P^3$
4	Q, H, P, d	QH/P
5	Q, H, D, d	Q^3d/D^4H
6	Q, P, D, d	Q^3d/D^4P
7	H, N, D, d	H/D^2N^2d
8	H, N, P, d	$P^2N^3d^3/H^5$
9	H, P, D, d	P^3d/D^4H^3
10	P, N, D, d	P/D^5N^3d

For example, where Q_0, D_0, N_0, D_1, and N_1 (subscripts 0 and 1 represent two different sets of conditions) are known and Q_1 is desired, Grouping 1 takes the form: $Q_1 = Q_0(D_1/D_0)^3(N_1/N_0)$.

The "Constant Variable"

If any of the variables in these groupings are constant for a particular problem (*e.g.*, D is constant in a study on the same fan), then a grouping containing this "constant variable" can be used for studying the interaction of the remaining variables. Thus, in Grouping 1 for a particular fan, the familiar direct linearity between flow rate and fan speed is evolved, regardless of gas density.

Because the groupings developed previously are dimensionless, they can be multiplied or divided by constants without affecting their validity. In some chemical process work, a specified weight rate of air is required rather than a volume rate. Since the weight rate, W, is proportional to QD, mathematical treatment with the constant, W, will yield Table 2. This table will then define the cases where there is a constant weight rate of air supplied.

TABLE 2—FAN VARIABLES FOR CONSTANT WEIGHT RATE

Grouping	Constant	Variables	Dimensionless Grouping
11	W	N, D, d	D^2Nd
12	W	N, H, d	H^2/N^4d
13	W	N, P, d	P^3d^2/N^4
14	W	H, P, d	Pd/H
15	W	H, D, d	HD^4d
16	W	P, D, d	PD^4d^2
17	W	Q, d	Qd

The need for a constant blade tip speed is sometimes encountered when the linear exhaust velocity is desired constant, possibly to limit duct noise output. Since tip speed, V, is proportional to ND, Table 3 can be developed. This table gives the necessary groupings when there is a constant blade tip speed.

TABLE 3—FAN VARIABLES FOR CONSTANT BLADE TIP SPEED

Grouping	Constant	Variables	Dimensionless Grouping
18	V	Q, D, d	Q/D^2
19	V	Q, P, d	P/Qd
20	V	Q, H, d	H/d
21	V	D, H, d	H/d
22	V	D, P, d	P/D^3d
23	V	H, P, d	H/d
24	V	N, D, d	ND

Typical Fan Problem

A No. 30 fan can handle 10,000 cfm, at a static pressure of one inch of water, when handling air. For this condition, this fan requires 2 hp and must be driven at 750 rpm. What will a No. 50 fan of similar design deliver against a static pressure of 2 inches of water when handling a gas of relative density 0.7? Also, what fan speed and horsepower will be required?

From Grouping 5, solve for Q_1:

$$Q_1 = Q_0(H_1/H_0)^{1/2}(D_1/D_0)^2(d_0/d_1)^{1/2}$$
$$Q_1 = 10{,}000(2/1)^{1/2}(50/30)^2(1/0.7)^{1/2}$$
$$Q_1 = 47{,}000 \text{ cfm}$$

From Grouping 7, solve for N_1:

$$N_1 = N_0(H_1/H_0)^{1/2}(D_0/D_1)\,(d_0/d_1)^{1/2}$$
$$N_1 = 750(2/1)^{1/2}(30/50)\,(1/0.7)^{1/2}$$
$$N_1 = 761 \text{ rpm}$$

From Grouping 9, solve for P_1:

$$P_1 = P_0(H_1/H_0)^{3/2}(D_1/D_0)^2(d_0/d_1)^{1/2}$$
$$P_1 = 2.0(2/1)^{3/2}(50/30)^2(1/0.7)^{1/2}$$
$$P_1 = 18.8 \text{ hp}$$

Any convenient grouping containing the desired variables might have been chosen.

LEAD SPECIFICATIONS FOR CHEMICAL DRAINAGE

The following specifications for chemical laboratory drainage systems are suggested by Lead Industries Association, New York, N. Y.:

Laboratory drainage and vent systems shall not be directly connected to the sanitary drainage system of any building. Laboratory wastes may discharge into the building sewer only after passing through dilution or neutralizing chambers acceptable under local and state plumbing, building or health department requirements.

Materials

All lead products for chemical laboratories shall be made from pig lead meeting requirements of ASTM specifications serial designation B.29 for chemical, acid or copper lead grades. Antimonial (hard) lead when specified shall be an alloy containing 4.0 to 7.5% antimony.

Lead Waste and Vent Piping—Lead waste and vent pipe for chemical laboratories shall be in accordance with the following table conforming to Federal Specification *WW-P-325* (Order or specify by inside diameter and wall thickness.)

Inside Diameter, Inches	Wall Thickness, Inches	Nominal Weight per Ft, Lb
1¼	0.171	3.75
1½	0.191	5.00
2	0.205	7.00
2½	0.250	10.62
3	0.250	12.50
4	0.250	16.38

(*Exception*—for educational units, *D* or *XL* weight lead pipe, in accordance with Federal Specification *WW-P-325*, may be used where accessible.) Where lead is built into concrete walls, floors or other masonry, it shall be painted one coat heavy asphalt paint.

Lead Traps—Lead traps shall have a wall thickness comparable to the lead pipe to which it is connected and have at least a 2-inch trap seal and be either 3-inch or 4-inch drum trap pattern or anti-syphon pattern. All cleanout plugs and trap screws and rings shall be of cast hard lead with standard pipe threads and ring shall be lead welded to the body of the trap. (Trap pattern shall conform to local plumbing regulations.)

Sheet Lead—Sheet lead shall comply with the dimensional tolerances of Federal Specification *QQ-L-201*, 1953, for Sheet Lead.

Lead Lined Sinks—Lead lined chemical laboratory sinks shall be lined with at least 6-lb sheet lead using lead welded joints and seams. The sheet lead shall be formed over the rim of the sink to form a complete lining covering all surfaces exposed to fluids or splash.

Lead Cup Sink or Waste Bowl—Lead cup sinks or waste bowls shall have a wall thickness of at least 5/32-inch and be cast lead, either hemispherical 6-inch dia or oval 3 inches by 6 inches, or be spun from lead pipe. Threaded tailpiece connection, either cast with bowl, or lead sink plug and strainer is acceptable. (Bowls made from 10-lb sheet lead may be used.)

Lead Lined Table Troughs—Lead lined table troughs shall be lined with at least 6-lb sheet lead with all joints lead welded. Outlet end to be extended below supporting material to prevent capillary attraction carrying fluids along underside of trough into table construction.

Lead Covered Table Tops—At least 6-lb soft or 4-lb hard sheet lead shall be used for lead-covered tables with lead formed firmly over all edges and corners by bossing or folding. Corners may be cut and welded.

Acid Trays—Lead-lined acid trays shall be lined with at least 6-lb soft or 4-lb hard sheet lead with all joints lead welded. A 1½-inch lead sink plug and strainer shall be used for outlet connection.

Joints and Connections

All joints in lead pipe or sheet shall be lead welded. Soldered joints are not permitted.

Lead Welded Joints—Lead welded joints for waste and vent piping shall be regulation lead welded joints fused together to form a uniform weld at least as thick as the pipes being joined. Lapped joints shall be used on sizes up to and including 2 inches.

Lead welded joints for sheet lead shall be regulation lead welded butt or lap joints fused together to form a uniform weld at least as thick as the material being joined. Butt joints with beveled edges shall be used for sheet over ⅛ inch thick.

Lead welding rod shall be of same composition as material being welded. *Note:*—In the past the common term for lead welding has been lead *burning*. Since the result of the operation is a true weld, this is a misnomer.

Sink and Acid Tray Waste Connections—Lead waste connections for lead lined sinks or acid trays shall be made by using proper size lead sink plug and strainer with lock nut or by welding strainer body to lead lining.

Alberene Stone or Other Chemical-Resisting Sink Waste Connections—Lead waste connections for this type fixture shall be made by using proper size lead sink plug and strainer with lock nut. Red or white lead putty may be used under sink plug body to form gasket.

Chemical Sink Plugs and Strainers—Lead sink plugs, bee hive standing overflows and strainers shall be made of cast or extruded hard lead using hard lead tailpiece for trap inlet connection. All threads to be standard pipe thread. Joints may be union, flange, or welded where tailpiece is joined to strainer piece outlet.

Waste and Vent Connections—All joints between lead pipe or fittings and acid resisting cast iron shall be made as follows:

When lead waste or vent pipes are connected into acid resisting cast iron with calking hub, a regulation lead-calked joint shall be used except that treated asbestos packing is used in place of oakum.

Cast hard lead ferrules, welded to lead pipe shall be used. Brass ferrules may be used when the lead pipe is extended through the ferrule and turned back over the bead on the spigot end of the ferrule. The inlet end of the ferrule is lead welded to the lead pipe.

When lead waste or vent pipes are connected to acid resisting iron or steel pipe with regulation standard pipe threads, the lead pipe is welded to cast hard lead bushings or nipples. When brass nipples or brass bushings are used the lead pipe shall extend through them with lead welded joint used on inlet and outlet end. Lead to lead flange joints may also be used.

Hangers and Supports

Piping shall be installed without undue strains and streases and provision made for expansion, contraction and structural settlement in accordance with the following recommendations:

Vertical Piping—Vertical lead pipes shall be supported at intervals not to exceed 4 ft. Flanges, tacks or straps welded to pipe shall be used.

Horizontal Piping—Horizontal lead pipe shall be supported by angle or channel irons, heavy sheet-metal troughs, wood strips, or otherwise, over its entire length.

Piping in Concrete—All chemical laboratory piping shall, where construction permits, be placed or installed in chases or recesses which will permit access to the piping for repair or replacement.

Safe Pans

Chemical laboratory room floors where required shall be completely lined with at least 6-lb sheet lead safe pan with an upstand at least 6 inches on all walls.

Folded corners of pans when used shall be set tightly against the upstands and lead welded along the top of the fold. Tops of upstands shall be set back ¼ inch into notches in studs on frame construction. Upstands shall be dressed tightly against masonary walls. In rooms too large to be covered by a single sheet of lead, seams joining sheets shall be lapped at least ½ inch in direction of flow and lead welded. Concrete under the pan shall be brought to a smooth finish with a mixture of cement and sand, and the lead coated on both sides with a good grade of asphaltum paint. Wood floors under the pans shall be firm and even with nail heads set, and made of not less than 1-inch well-seasoned boards covered with asphalt-impregnated building paper weighing at least 15 lb per square. Inside of pans on wood floors shall be coated with asphaltum paint.

A cement and sand mixture shall be used inside pans as foundation for the finished floor. Pans shall be graded to the acid resisting floor drain to which they shall be securely fastened. The trap flange shall be countersunk and weep holes provided in the drain just above the pan. The pan shall be tested upon completion by plugging the trap and filling with water.

Safe Waste—The safe waste, when used in place of weep holes in floor drain, shall be 1-inch lead pipe, considered as an indirect waste, and discharge over a service sink or floor drain.

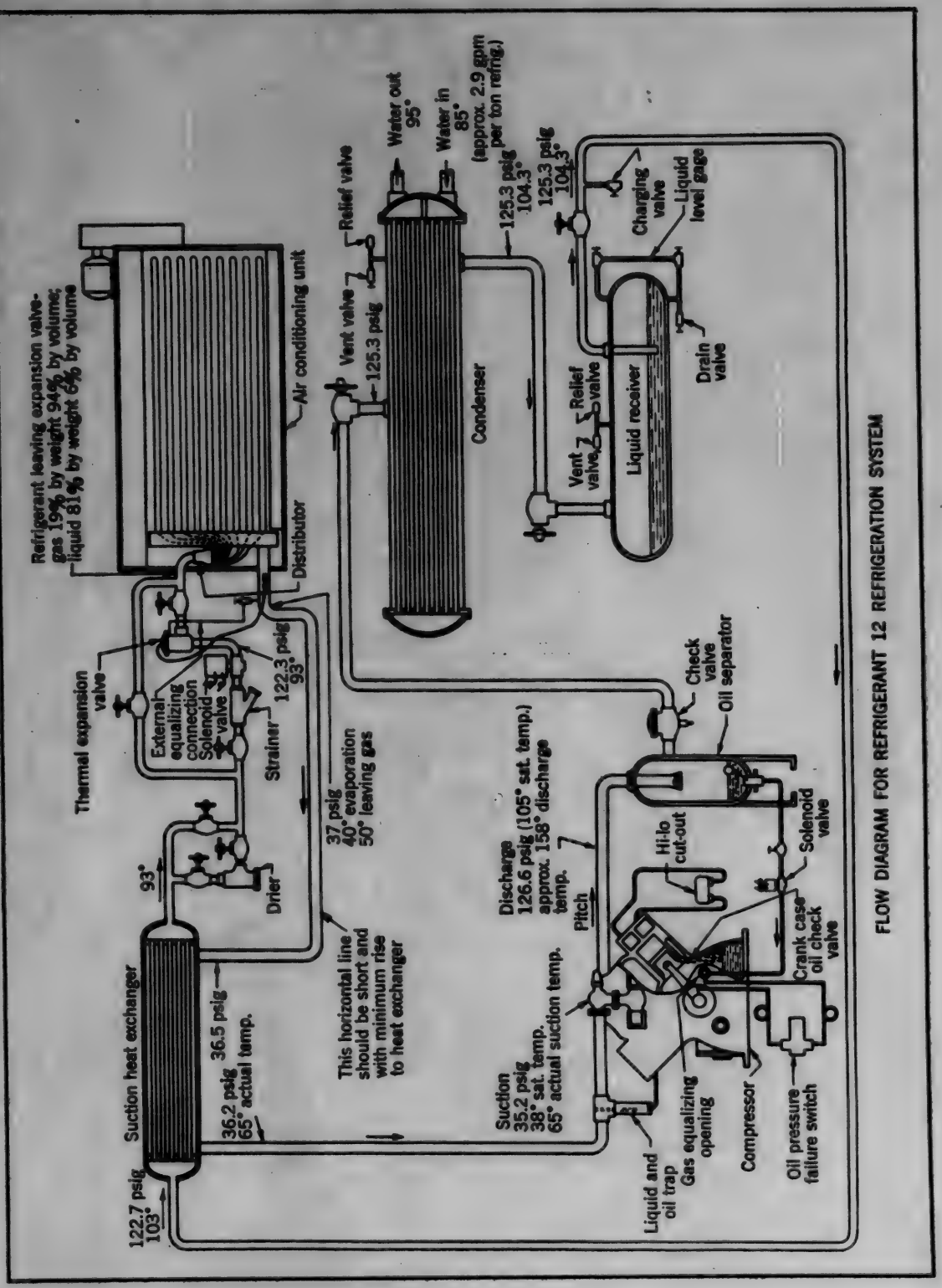
Neutralizing Basin

Lead linings for neutralizing basins or dilution tanks for chemical laboratory waste in buildings shall be of at least 12-lb sheet lead with lead welded joints.

Fume Hoods and Ducts

Fume hoods and ducts shall be constructed of at least 6-lb sheet lead supported in an angle iron framework. Sheet metal having a bonded lead coating thickness of lead of at least 1/16th inch may also be used.

REFRIGERATION PIPING HOOKUP

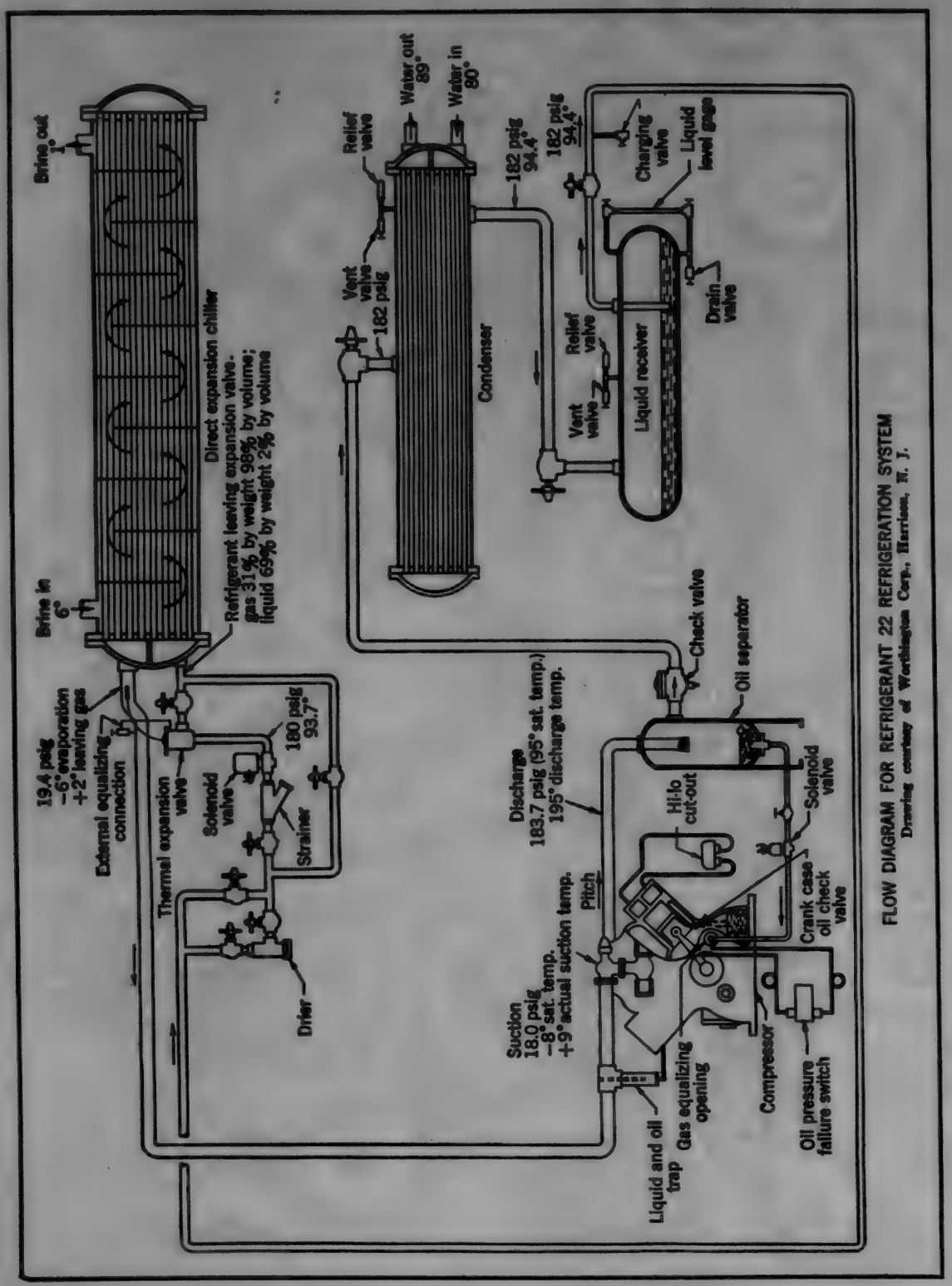


FLOW DIAGRAM FOR REFRIGERANT 12 REFRIGERATION SYSTEM

DETAIL SHEET — AIR CONDITIONING, HEATING AND VENTILATING

May 1959

REFRIGERATION PIPING CIRCUIT



FLOW DIAGRAM FOR REFRIGERANT 22 REFRIGERATION SYSTEM
Drawing courtesy of Worthington Corp., Harrison, N. J.

Industry uses large size

Ammonia Reciprocating Compressors

O. B. WERT and J. E. GARLACH
Worthington Corp., Harrison, N. J.

Reliability and low maintenance have favored the use of reciprocating compressors for heavy duty installations in industry. Engineering features of this type unit such as compression stages, drive and efficiencies are covered.

THE heavy-duty water cooled reciprocating compressor has steadfastly maintained its significant position in the refrigerating industry. Applications are ever increasing, keeping in step with the many changes in our economy.

Reciprocating compressors employed today in large commercial and industrial refrigerating systems, have been designed for higher efficiency in operation and greater safety for plant operating personnel. Numerous sizes and types are available to suit the buyer's requirements. Types or styles of reciprocating compressors are the horizontal double acting (see Fig 1), duplex vertical single acting, vertical double acting Y-type, and the horizontal balanced opposed type. Capacity controls may be purchased to bring the compressor tonnage in balance with a changing cooling load.

Horizontal double acting ammonia compressors of the reciprocating type have many advantages. The single acting compressor in the small or large capacity sizes cannot offer the same economy of operation that is an inherent characteristic of the double acting design.

Comparison of Efficiencies

When a single acting compressor is employed in lieu of a double acting one, its mechanical efficiency is obviously lower because friction horsepower is the same for both types. Also, if given two units, a single acting and a double acting machine running at the same speed, with identical bore and stroke and having the same number of cylinders, the piston displacement of the double acting design is virtually twice that of the single acting type.

Since mechanical efficiency is the ratio of the indicated horsepower to the brake horsepower, the horsepower per ton of refrigeration for a unit operating single acting. Fig. 2, is much higher than the same unit operating double acting.

Increasing the clearance volume of a compressor, decreases its pumping capacity. The reverse of this is likewise true. The piston displacement times the volumetric efficiency is the pumping capacity of the unit. The two factors in design, which seldom go hand-in-hand, are lower drive horsepower and high volumetric efficiency. To obtain a low drive horsepower, the valve area must be adequate, which necessitates a greater clearance volume. Large valve areas are incorporated in the cylinder design to obtain low horsepower. This more than offsets sacrifice of volumetric efficiency.

The compression efficiency of any compressor is dependent on the type of valve used, the valve area, the resulting gas velocity through the valves and the ratio of compression. Large valve area reduces valve friction losses, thus increasing efficiency. The manufacturer designing and building this class of machine for many years has access to a wide selection of cylinder patterns. The pattern chosen from this selection can be altered to give large valve area at very little additional expense to the purchaser. The excess energy required to force the gas through inadequate valve areas and passages is power uselessly expended.

The mechanical efficiency of a compressor is at its best when the machine is fully loaded. The friction of the machine changes little even though its load may vary over a wide range. Here again the wide selection of cylinders allows the designed to load the frame more fully for the actual conditions of service. A heavy frame does not have to be used for a low horsepower requirement as may be the case when a highly standardized design is employed for a wide variety of service conditions.

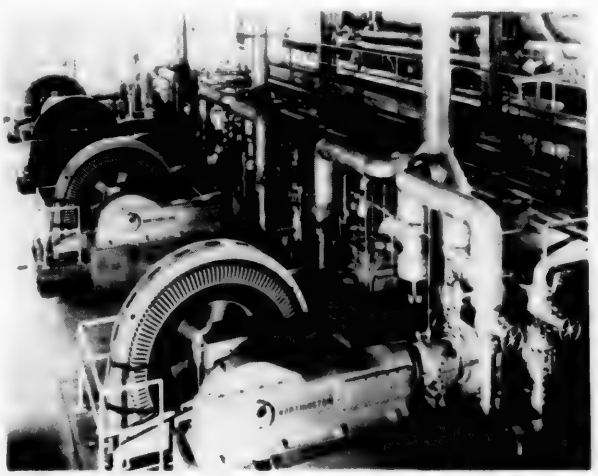


Fig. 1. Four horizontal duplex ammonia compressors installed in a Pacific Coast brewery. A total of 1660 tons of refrigeration is used to make and process beer.

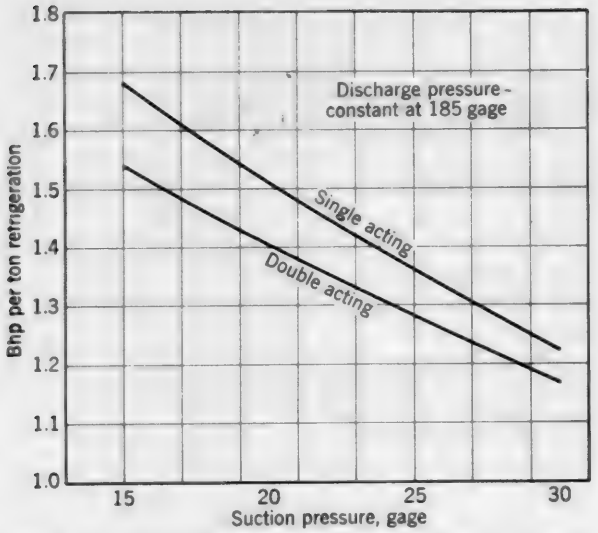


Fig. 2. Approximate BHP per ton refrigeration vs. suction pressure.

The double acting compressor may be built in a two-stage design for obtaining very low temperature. For such jobs, the gas between the stages is cooled to keep discharge gas temperature from the high stage within safe limits. See Fig. 3. Additional operating economy may be obtained by subcooling the liquid ammonia from the condenser at the interstage pressure, Fig. 4, thereby lowering the horsepower per ton of refrigeration.

Stages of Compression

When the total ratio of compression is high, the reciprocating double acting compressor is generally built with two or more stages of compression. This, of course, improves the volumetric efficiency of the unit, and results in smaller compressor cylinders, lower maximum frame loadings, and often an improved mechanical efficiency. Two-stage compressors may be used without gas intercooling, if the primary purpose of two-staging is for volumetric and mechanical reasons and not high compressor discharge temperatures or for an economy of operation.

Single stage compression results in heavier frame loading than would be the case if the machine were built two-stage. Although service conditions may indicate single stage, it is sometimes possible to save the purchaser initial cost by building the machine two-stage without intercooling, as the lighter frame loading may permit the use of a lighter and less costly frame pattern than would be necessary if single stage were employed. Usually smaller or lighter running gear operates at higher speeds, thereby permitting the selection of less expensive drivers which are direct connected.

Compressor Drive

The horizontal double acting compressor may be driven by any of the usual forms of prime movers. The engine type synchronous motor is used extensively since it has a very high efficiency and makes a very compact arrangement. Synchronous motors may have considerable power factor correction effect in the electrical system. Frequently the electric company will give a better power rate if this type of motor is used, since it will benefit their distribution system.

When large compressors are to be driven by either steam or gas engines, the compressor and prime mover are usually built integral, which provides a very efficient installation, low in maintenance and at the same time more compact and less expensive to install.

Lubrication

Most of the larger (250 hp and above) horizontal compressors employ a full pressure lubrication system for the complete running gear. As a rule a gear type pump is driven by the crankshaft, but a chain drive can be used. The oil leaves the pump, passes through an oil filter and into the main bearing. Drilled passages in the crankshaft carry oil under pressure to the crankpin, connecting rod, crosshead pins and frame guides. A relief valve in the pressure system keeps the oil pressure constant and returns excess oil to the crankcase. On some of the smaller compressors, an automatic flood-oiling system is employed. This is obtained by means of a crank dipper on the crankshaft which throws oil on the crosshead and into a reservoir where it continuously floods the main bearing.

The compressor cylinders are lubricated by means of a mechanical force feed lubricator. The lubricator is driven by a linkage from the compressor running gear, supplying lubrication to the piston rod packing boxes.

Capacity Control

The simplest method of varying the capacity of any reciprocating compressor is by changing its speed. Such speed variation is a comparatively simple matter when the compressor is driven by a variable speed prime mover such as a steam or gas engine. When the compressor is operated at constant speed, as when driven by a synchronous motor, some arrangement must be made to

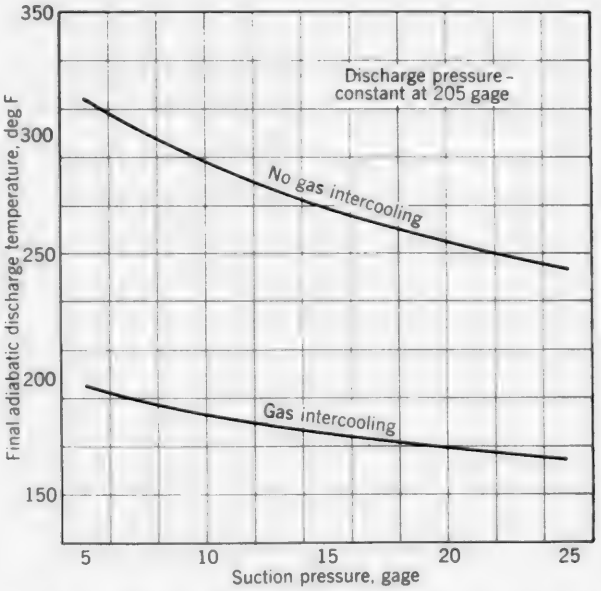


Fig. 3. Comparison of the final theoretical adiabatic discharge temperature, deg F, for a two-stage machine with and without gas desuperheating.

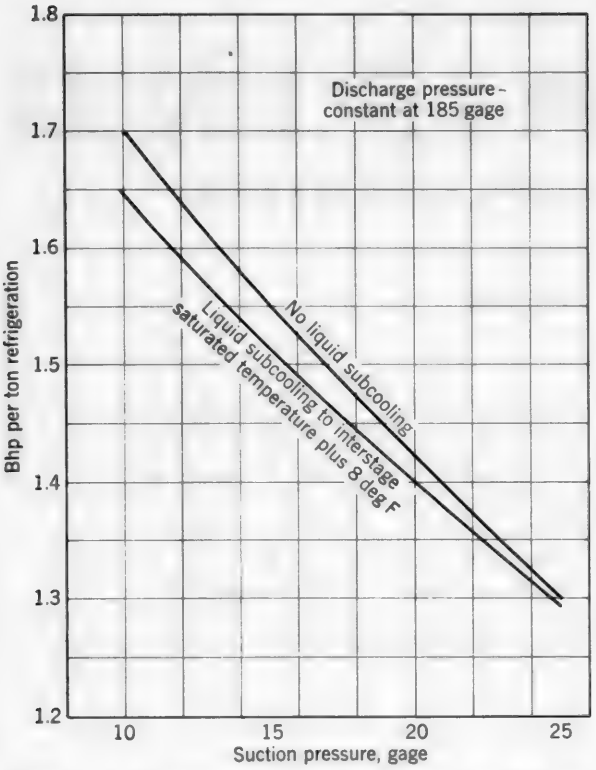


Fig. 4. As the suction pressure increases, the BHP per ton refrigeration decreases and the effect of subcooling becomes less.

change its gas pumping rate. This may be accomplished by the use of fixed volume clearance pockets (to lower compressor volumetric efficiency) or by means of suction valve depressors. A combination of both methods may be used to obtain a wide capacity variation.

The proved dependability of horizontal double acting compressors is responsible for its wide spread use in industry. In process operations, compressor equipment breakdown can cost thousands of dollars because of its vital role in overall plant operation. Reliability and low maintenance have made reciprocating compressors basic for heavy duty installations.

Definitions

Basic definitions applying to any type of reciprocating compressor are as follows:

Volumetric efficiency is the ratio of the volume of gas actually delivered (when reduced to the temperature and pressure at intake) to the piston displacement, or simply the capacity of the compressor to the displacement of the compressor.

Mechanical efficiency is the ratio of the indicated horsepower to that of the brake horsepower at the compressor shaft.

Compression efficiency is defined as the ratio of the work to compress adiabatically the gas delivered by a compressor to the work actually done within the cylinder as shown by indicator cards, or simply the ratio of the adiabatic horsepower to the indicated horsepower.

Brake horsepower is defined as indicated horsepower plus friction horsepower.

Ratio of compression is defined as the ratio of the discharge pressure in psia to the suction pressure in psia, never psig.

Half-a-Century Ago

Fifty years ago this month, this publication, then THE HEATING AND VENTILATING MAGAZINE, was one month shy of being five years old. When reviewed in the light of today's sophisticated engineering techniques, some of the articles and items in the May, 1909, issue date themselves by their very nature; some titles, however, seem disturbingly topical. For example, one news item carried a comparison of hot water, gas and electric heating.

On the editor's page, we read: "It is becoming generally recognized that one of the principal problems before the heating engineer in the immediate future is in connection with humidity calculations as applied to the ventilation of buildings. Heretofore the problem has chiefly occupied the attention of those engaged in dryer and similar work. Barring the use of the water pan in warm air furnaces, however, it is safe to say that, up to the advent of the air washer, the supply of humidity to air for breathing purposes was hardly thought of as part of the duties of the heating engineer.

"This is not so now. On the contrary, heating engineers are absorbing all the information they can obtain regarding humidity calculations and their application to heating work. For this reason we feel fortunate in being able to present in this issue a new humidity chart designed to facilitate the processes of calculation, together with a new humidity table, recalculated and enlarged to include values never before tabulated."

The leadoff article that month was entitled "Heating and Ventilation of St. Luke's Hospital, Cleveland, Ohio" and carried the subtitle, "Use of Double Ducts for Tempered and Warm Air". It began: "The heating and ventilating of St. Luke's Hospital, Cleveland, Ohio, is accomplished by a fan system and a small amount of direct radiation, the direct radiation being placed in the halls only. Steam is furnished by two 60 H.P. tubular boilers equipped with Murphy stokers, each boiler being capable of doing the work alone. The average boiler pressure is about 75 lbs., and the pressure is reduced from this point to suit the various requirements of the building, such as cooking apparatus, sterilizing plant, laundry work and the heating system.

"The fresh air for the entire building passes through tempering coils, and thence through an air washing device to the fan and through the re-heating coils. There is a damper under the re-heating coils which admits tempered air to the air piping system. There is a double system of galvanized piping carried on the basement ceiling; one for tempered air and one for warm air, these systems unite at the mixing dampers at the base of each heating flue. Regulation is by means of hand-operated chain."

LOUIS BLENDERMANN ON

PIPING AND PLUMBING

Access Doors

IN modern buildings there is an ever increasing tendency to conceal all valves, apparatus, equipment and devices that need not be exposed. Thus, rest rooms, kitchens and all other types of spaces will contain fixtures and equipment that must be exposed, whereas the apparatus and devices that serve such fixtures and equipment will be concealed. As a result of this changing trend in building needs, access doors are important in providing a means of entry or access to the concealed apparatus and devices.

Types of Access Doors

Access doors of all sizes, shape and description are available. They are round, square, rectangular and can be furnished in any desired material construction. Materials include steel, brass and stainless steel. Finishes on these doors can be enamel, chrome plate, buffed, and varying degrees of luster. Doors may be opened by means of a screwdriver, a handle or may be equipped with a cylinder lock which limits use to those with a key. Access frames are secured to the construction nails, screws or anchor straps that are attached to the construction.

Typical Access Door

Figure 1 shows a typical access door and some of the different types of construction in which it can be installed. This figure shows the type of framing which is usually placed in the wall construction.

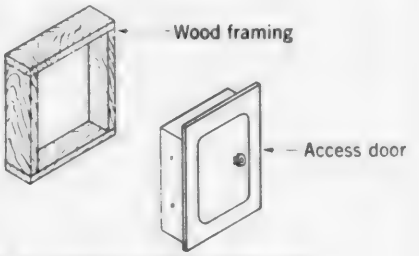
An access door should possess certain qualities which enhance its appearance and function. First, the door should open a full 180° and should fit tightly against the frame when it is closed. A good hinge is a definite asset and will ensure that the door and frame make a neat appearance in any room. Corners of the door should be turned or rounded as shown to avoid sharp corners that could be dangerous to the maintenance man when he is working on the concealed equipment. The flange, when this type of unit is used, should be broad enough to hide the rough construction into which the access frame is fitted.

Installation Facilitated

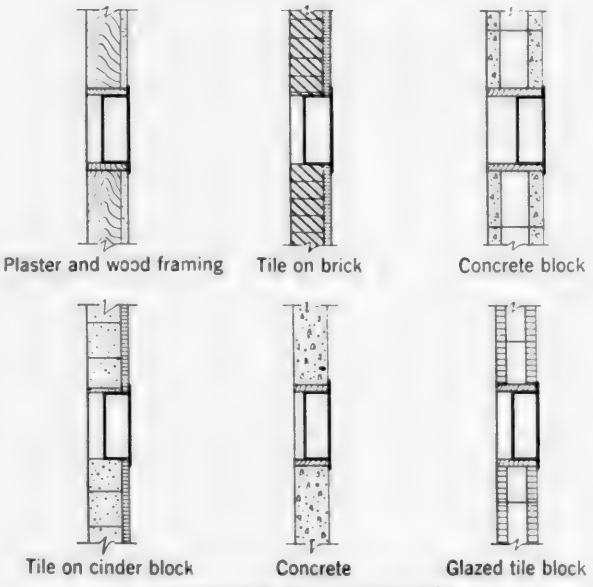
The access door can be fitted in any one of the several variations of construction indicated in Fig. 1. In every one of these installations, wood framing can be used to facilitate the ease of securing the access frame to the construction. An access door and frame are usually not set in place until all the rough construction work has been accomplished. This practice prevents any damage that could mar the high finish or luster of the unit. When wood framing is not used, a piece of steel must be placed at the top of the opening to support the brickwork over the opening.

Applications

Access doors have numerous applications in a building. Without getting into a lengthy description that covers all these applications, a general mention is made that the access door is used to gain entry to all concealed valves,



DETAIL OF TYPICAL ACCESS DOOR AND THE WOOD FRAMING THAT IS OFTEN USED TO FACILITATE ITS INSTALLATION



VARIATIONS IN CONSTRUCTION

Fig. 1. Typical access door and how it may be installed with several types of construction.

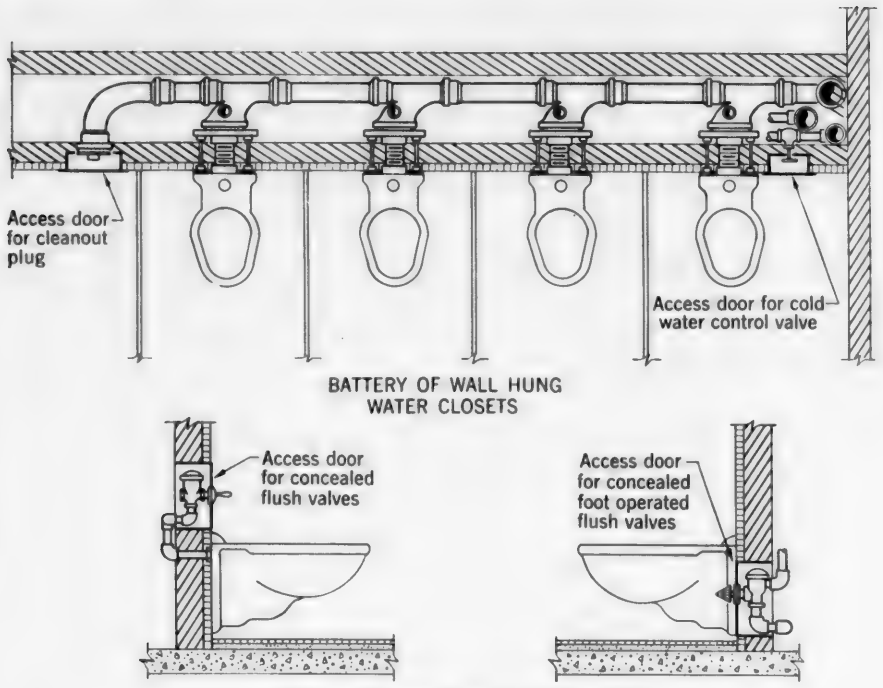

Access door for cleanout plug
Access door for cold water control valve
BATTERY OF WALL HUNG WATER CLOSETS
Access door for concealed flush valves
Access door for concealed foot operated flush valves
ACCESS TO CONCEALED FLUSH VALVES

Fig. 2. How access doors may be used to gain entry to concealed valves and equipment in a typical rest room with water closets.

apparatus, devices and spaces where equipment is contained. In a large building, the required number of access doors may be in the hundreds.

Typical Rest Room

Figure 2 represents a typical rest room and shows just where the access doors are placed. Referring to the battery of water closets shown, note that an access door is placed in front of the valve used to control the cold water supply to the water closets. Without an access door at this point it would be necessary to extend the valve handle through the construction. This arrangement with exposed valve handles is neither neat in appearance nor practical from the standpoint of maintenance.

With an access door it is an easy matter to shut off, inspect, repair or maintain the control valve. Furthermore, the access door affords the maintenance man sufficient room in which to work and to gain entry to the cleanout plug. This particular access door may be any one of several different shapes that are most appropriate for its function. The finish of both access doors should be such as to enhance the finish of the room itself. Chrome plated brass or polished stainless steel would appear to be most preferable.

Refer to the details of the water closets to note how access doors are used to gain entry to concealed flush valves. One type of flush valve includes a handle while the other features a foot operated valve. These particular access doors may be equipped with either a hinged door or a door that is secured with screws. Since the flush valves are set in the boxes as shown, they are quite accessible for ease of maintenance.

Although wall mounted water closets were shown in the installation, the same type of access doors could be applied if floor mounted water closets are used. The only exception might be the location of the access door for the cleanout.

Access Corridors

Access corridors are becoming very popular in many types of buildings including schools, office buildings, hospitals, research laboratories, industrial and other types of buildings. The access corridor is very practical because it permits sufficient space for the maintenance man to repair and adjust all concealed equipment without disrupting the service in the men's and women's rest rooms. The access corridor is lighted and offers an ideal working space. An access door has a good application for spaces indicated in Fig. 3.

For this application a large rectangular access door and frame is used. The door is equipped with a cylinder lock which requires that a key be used to open the door. This limits entry only to authorized personnel. In this case the access door can be of enameled steel or stainless steel.

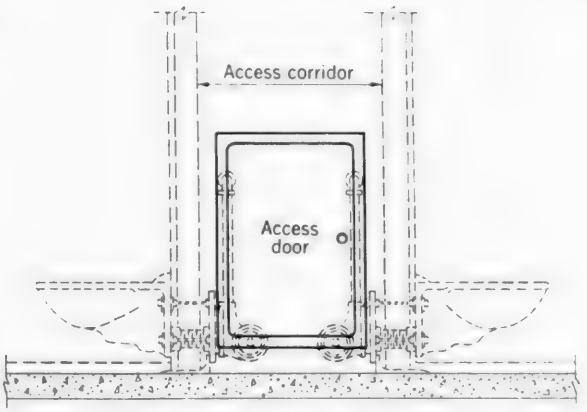


Fig. 3. Access door used to gain entry to an access corridor between a double battery of plumbing fixtures.

The same type of access door can be applied to a double battery of fixtures that include floor mounted water closets, or even to a single battery of fixtures that include either wall or floor mounted water closets.

Battery of Lavatories

For the manner in which access doors are used with a battery of lavatories, see Fig. 4.

Of first importance is the access door for concealed control valves. It provides ease in maintaining these valves for the cold and hot water branches serving lavatories.

Quite often, a soap piping system is used to convey liquid soap to dispensers located over each lavatory. When this system is utilized, it would be installed in a manner similar to that shown in Fig. 4. The soap tank is either exposed on the wall surface or is concealed in the pipe space. If the soap tank is concealed, an access door can be helpful to gain entry for filling the tank and maintain piping.

The enlarged detail shows how the access door is installed for the soap tank. The access door must be of a size to allow the soap tank to be filled without difficulty. Thus in filling, it is only necessary to lift the soap tank cover and pour in the liquid soap.

The soap piping includes a valve and a cleanout. Frequently, the soap piping must be cleaned of deposits that have hardened. For this flexible rods with a brush at the leading edge are used. This implement is inserted into the cleanout and is pushed through the piping to clear the line of its deposits.

The other enlarged detail illustrates how the access door is placed for the maintenance man to make inspections and repairs of the control valves.

For the sake of appearance, the access doors used in these specific locations should be neat and trim units. It is therefore suggested that the units be of either chrome plated brass or stainless steel. A cylinder lock for both access doors will prevent tampering.

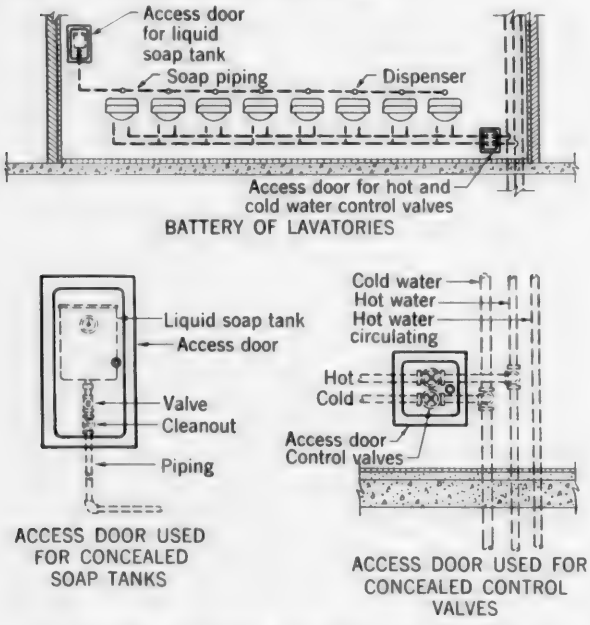


Fig. 4. Access door used to gain entry to concealed valves and equipment in a rest room with lavatories.

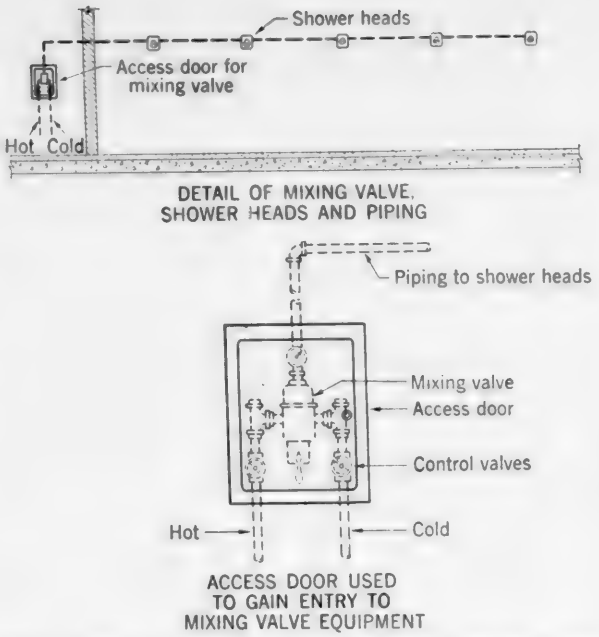


Fig. 5. How an access door can be used in a shower room where the control and temperature of the water is at a remote mixing valve station.

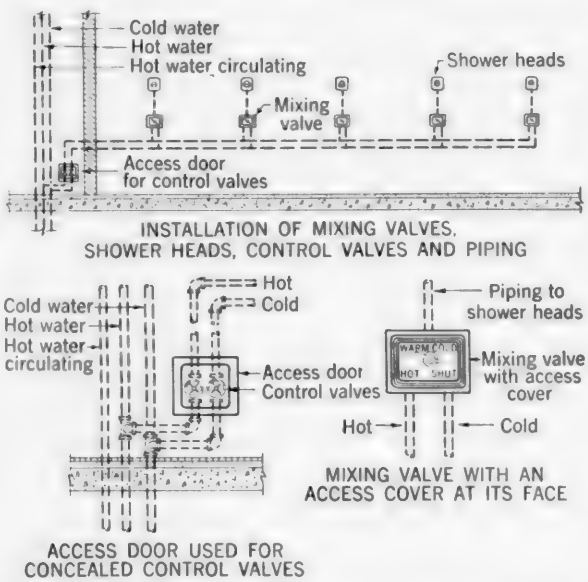


Fig. 6. Access door in a shower room to gain entry to mixing and control valves.

Special Shower Rooms

Access doors also have application in special shower rooms as suggested in Fig. 5. The particular type of shower room shown is used in schools, institutions and other applications where this type arrangement is needed. The control and mixing valves are placed in a remote location where an operator controls both the supply and the temperature of the water to the shower heads.

The access door in this instance should be chrome plated brass or stainless steel and should include a cylinder lock to prevent tampering.

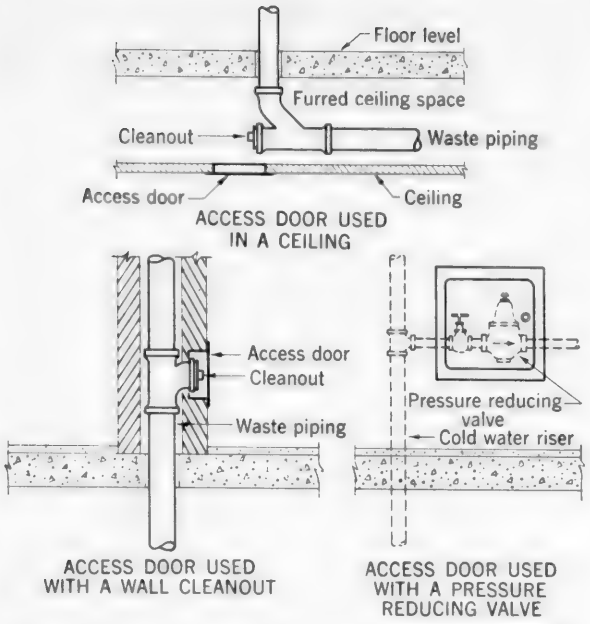


Fig. 7. How an access door may be used with other plumbing equipment.

Typical Shower Room

The arrangement for a regular shower room will be similar to that shown in Fig. 6.

Here an access door is used for the control valves that supply the showers. In addition, access doors are used at each shower for the mixing valves.

The enlarged detail shows an application of the access door for the control valves. The other enlarged detail shows the type of access door that is used for the mixing valves. The mixing valve apparatus is concealed behind the face plate. To get at this equipment it is necessary only to remove the face place. The advantage in this type of unit is that it offers access to the concealed equipment and because the face plate is recessed, there are no handles protruding beyond the face of the wall which could cause injury if a person slipped and fell against the exposed handles. Descriptive information on this innovation in mixing valves may be obtained by writing to "Lawler Automatic Controls, Inc.," Mount Vernon, N. Y.

Other Typical Installations

Several other types of applications for an access door are presented in Fig. 7.

One detail shows how the access door may be set into a ceiling to gain entry to a cleanout in the waste piping that is installed in the furred ceiling space. If water piping were installed in the furred ceiling space, access doors could be used in the same manner.

Another detail shows how an access door can be used for cleanouts in vertical waste piping that is installed in pipe spaces. Several different types of access doors are available for this purpose.

The last detail shows how an access door can be used in the service of pressure reducing valves. In tall buildings pressure reducing stations may be installed on the water branch lines on a number of floors. Since pressure reducing valves need a certain amount of inspection, adjustment and care, an access door offers an ideal means of performing this necessary task. The unit of course should include a cylinder lock to prevent tampering by unauthorized persons.

In addition to all the suggestions offered, there are many more applications for which the access door can be used. It is recommended that when you contemplate access doors in your design, you show the units on your plans and describe them in your specifications. This is better practice than to leave this important matter to the contractor.

Coal-Burning Gas Turbine for Power Generating Plants

In order to increase the overall efficiency of steam-cycle power generating plants supplying billions of kilowatt-hours of electricity to the nation, and to provide power generating facilities for the vast arid regions of the West, the U. S. Bureau of Mines is preparing to conduct research and development to establish the feasibility of the coal-burning gas turbine for power generation in stationary plants, according to Colonel R. B. White, chairman of the Locomotive Development Committee of Bituminous Coal Research, Inc.

The stationary plant development program, planned to be conducted at the Morgantown, W. Va., station of the U. S. Bureau of Mines, will take advantage of more than 12 years of research and development carried out by the Locomotive Development Committee. Approximately $5½-million has been spent since 1945 by coal companies and railroads sponsoring the Committee's work. More than 100 patents issued and approximately 25 patents still pending are being made available to the Bureau of Mines. The Committee is lending to the Bureau a full-size 4200-hp gas turbine installation valued at $1,200,000.

Colonel White, who is also chairman of the board of the Baltimore and Ohio Railroad Co., told the Bureau that the original objectives of proving the feasibility of a direct fired coal-burning gas turbine have been successfully achieved.

At the beginning of the project to develop the coal-burning gas turbine for motive power use, three basic problems existed:

1. Feeding coal to the combustion chamber at elevated pressures,
2. Burning coal at high temperatures and pressures, and
3. Ash control and elimination.

Colonel White said that coal combustion at elevated temperatures and pressures was accomplished at combustion efficiency of 97% in a film-cooled jet airplane type combustion chamber of Locomotive Development Committee design. He indicated that ash control was accomplished through the development of a high efficiency dust collection system by the Committee, and by turbine design that controlled gas flow through the turbine to minimize erosion and give turbine life satisfactory for locomotive use. The coal feeding problem was solved by a coal pump that provided metering and pressurized feeding of the pulverized coal.

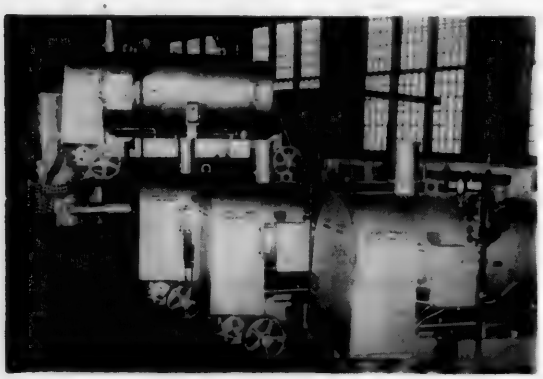
PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Mobile Package Boilers Will Thaw Ice On St. Lawrence Seaway Locks

Four mobile package boilers, manufactured by Cleaver-Brooks Co., Milwaukee, Wis., will be used in a unique application on the St. Lawrence Seaway. The specially designed units will be used to thaw ice on the locks, the first such application for the company's products. The four 40-hp boilers, costing about $20,000, have just been shipped to Massena, N. Y., where they will be put to work immediately.

According to a company spokesman, the light-oil-fired units will be used to melt the ice accumulated on the



lock stop-logs. These stop-logs are barriers consisting of 10 steel plates approximately 90 ft wide and 8 ft high. They are reinforced in the rear by heavy angle construction. Two stop-logs are lowered into slots on the canal side of the locks. As soon as they are in place, the lock is pumped dry and the gates are moved to the half-open position and stored for winter.

These stop-logs are not completely water tight and there is a seepage of water through the cracks. This water freezes on the inside of the locks, up to thicknesses of 48 inches. During mild weather, when water accumulates within the lock, it is usually pumped out to prevent any damage to the gate because of a further freeze. It takes nature many days to defrost this ice accumulation, and here is where the mobile boilers come into play.

Over each stop-log on the lock side, a canvas cover enclosure approximately 90 ft wide, 80 ft high and 10 ft deep will be formed. In this enclosure on temporary supports will be placed two unit heaters of sufficient capacity to maintain a 70 deg temperature with outside conditions at minus 10 deg.

The boilers, mounted on hard rubber wheels for portability, will be pulled into position and will feed steam at the rate of 1200 lb per hr to the unit heaters and to a steam gun which the operating crew can use to blanket the lock surface. The resulting blanket of steam and warm air will thaw the ice collected on the gate's surface, freeing the gate for action. During the summer, the boilers will be used for steam cleaning of the locks, gates, machinery and other equipment which is subjected to accumulation of oil.

Complete Partitioning Freedom Gained With Low Speed Air Diffusion

Clean, uncluttered ceilings and freedom of partition movement have been achieved through the use of low velocity air diffusion in a new, modular-designed industrial project, according to engineers at Sikorsky Aircraft, Stratford, Conn., a division of United Aircraft Corp. The low velocity diffusion system was specified for the air conditioning of the Sikorsky Engineering Building to gain complete space flexibility and eliminate the "forest of fixtures" appearance of ceilings.

For the new quarters, 5,100 Multi-Vent air diffusers have been installed in the acoustical metal pan ceilings of office, general and engineering space. Made by The Pyle-National Co., Chicago, the fixtures consist of flush-fitting, modular diffusion panels connected by flexible tubing to the duct system. By means of a valve arrangement within the panel, the air is slowed to a 30 to 40 fpm flow and gently dropped into the room vertically from a two-by-four foot perforated plate.

The low velocity diffusion method is reported to be well-suited to the needs of modular design. Buildings are designed on this concept to achieve a "built-in flexibility" of space by anticipating the need for future partitioning. This means that each module must be self-sufficient in terms of heating, air conditioning, ventilation and lighting facilities. The Sikorsky project was designed by Albert Kahn Associated Architects and Engineers, Inc., Detroit.

BOOK REVIEWS

Publications abstracted in this department should be ordered direct from publisher.

DEGREE-DAY DATA

A significant contribution to the literature on the degree-day unit is that of a two-volume set of books entitled *Handbook of Degree-Day Data for the United States*, prepared and published by the Department of Technical Services of American Petroleum Institute. Volume I is subtitled Statistical Summaries; Volume II, Basic Degree Data. Included in Volume I is a supplementary table giving the normal number of degree-days by months, with annual totals, for about 170 cities, these being the official Weather Bureau normals for the 30-year period from September, 1920 through June, 1950.

Most of Volume I, however, is devoted to elaborate tables, three for each of the 170 cities, presenting statistics for the 30-year period, including the number of degree-days by months for six different frequencies, 1 in 20, 1 in 5, and 2 in 5 for both warmer and colder years than normal, together with the mean standard deviation. Briefly, these data show what the remainder of the year will be like in number of degree-days under these different probabilities. The second table covers USWB normals, the third, trend statistics, including standard error, standard deviation and trend correlation coefficient.

Volume II, subtitled Basic Degree-Day Data, consists of a compilation obtained from Weather Bureau records and gives the number of degree-days reported by the 170 cities by months for the period from July, 1899, to June, 1955, together with 10 and 12-month totals. This volume, then, makes available actual degree-day data for a period of over 50 years, information not heretofore available.

Volume I is quite technical from a statistical standpoint, and would probably be useful only to those with a solid background of statistical theory and concerned with forecasting the number of degree-days (and fuel consumption). For one so concerned, both books are exceedingly valuable, well done, and contain almost priceless information.

Handbook of Degree-Day Data for the United States. Two volumes, 210 and 188 pages, respectively, 8½ x 11¼ inches, cloth bound. Published by the American Petroleum Institute 50 West 50th St., New York 20, N. Y. Price $7 each volume.

1959 ASHRAE GUIDE

The Heating Ventilating Air Conditioning Guide 1959, enlarged to an 8½ by 11 inch page size to provide additional space for new technical data, has been published by the American Society of Heating Refrigerating and Air-Conditioning Engineers. This 37th edition of the guide contains larger illustrations, working charts and tables including 286 new or revised diagrams and charts.

The 768 page Technical Data Section follows the general format of previous editions and is divided into 12 general sections:

Fundamentals; Environment, Comfort, and Physiological Principles; Heating and Cooling Loads; Room Heating and Cooling Methods and Equipment; Air Systems and Equipment; Steam and Water Systems and Equipment; Heat Generating Methods and Equipment; Refrigeration, Spray Apparatus, and Sorbents; Controls, Instruments, and Motors; Specific Applications; Industrial Systems; General.

The subjects for five new chapters are: High Temperature Water Systems, Heat Pump, Evaporative Air Cooling, Humidification, and Snow Melting.

Chapters have been edited and expanded to include new outdoor winter design temperatures based on probability of occurrence of various temperatures; new steam pipe sizing charts and tables based on Moody friction data for steam flow; a revised table on gages and construction of air ducts including low-, medium-, and high-pressure ducts; revised information and illustrations for unit ventilators and their application; and a rewritten chapter on automatic control with new illustrations of control applications. Also a general revision of the information on sorbents, including their use at elevated pressures; data on heat transfer coefficients for ventilated attics; revised information on sound absorption in ducts and plenums, noise levels, and diffuser noise; up-to-date values for maximum allowable concentration of contaminants in occupied spaces; a new section on the absorption refrigeration system; a new section on the gas-fired year-round residential air conditioner; new data on duct construction for residences; a revised discussion of fuel utilization, efficiency and consumption; a rewritten chapter on school systems; and additions and changes in the list of codes and standards.

In addition to the changes in the specific chapters mentioned, numerous other improvements have been made in both the text and illustrations.

For convenient reference to equipment for various types of installations the Catalog Data Section contains 461 pages showing the products of 309 manufacturers of heating, ventilating, cooling and air conditioning equipment. This section also includes an equipment index broken down under numerous headings.

The ASHRAE Psychrometric Chart, 24 x 32 inches, is included with each copy of the guide.

Heating Ventilating Air Conditioning Guide 1959, 37th Edition. Blue cloth bound, gold stamped, 8½ x 11 inches. Published by the American Society of Heating Refrigerating and Air-Conditioning Engineers, 62 Worth St., New York 13, N. Y. Single copy $12.

MECHANICAL REFRIGERATION

Covering both the theoretical approach and practical applications, Mechanical Refrigeration should appeal as a text book. The authors are Norman R. Sparks, professor and head of the department of mechanical engineering, and Charles C. DiLio, associate professor of mechanical engineering, both with The Pennsylvania State University. This is a second edition, and in revising the first edition, material on air conditioning and the heat pump has been expanded. Also included is a brief review of thermodynamics.

Beside covering basic thermodynamics and the prin-

(Concluded on page 148)

DEGREE-DAYS FOR MARCH, 1959

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 31st Year of Publication of Monthly Degree-Day Data

City	March			Season to Mar. 31, incl., from Sept. 1		
	1959	1958	Normal	1958-59	1957-58	Normal
Abilene, Texas (A)	299	544	344	2643	2876	2594
Albany, New York (A)	1010	892	989	6414	5775	6045
Albuquerque, New Mexico (A)	587	679	589	3808	4018	4030
Alpena, Michigan (C)	1194	1007	1156	6895	6399	6604
Asheville, North Carolina (C)	624	679	572	3768	4368	3677
Atlanta, Georgia (A)	422	461	404	2679	3156	2673
Atlantic City, New Jersey (A)	740	758	729	4635	4115	4060
Augusta, Georgia (A)	352	414	308	2384	2809	2076
Baltimore, Maryland (C)	602	635	611	3968	3782	3804
Billings, Montana (A)	755	962	958	5782	5531	6091
Binghamton, New York (C)	998	954	927	6086	5673	5662
Birmingham, Alabama (A)	404	462	378	2703	3117	2630
Bismarck, North Dakota (A)	980	1123	1187	7946	7220	7839
Block Island, Rhode Island (A)	868	860	865	4966	4480	4782
Boise, Idaho (A)	737	745	719	4451	4734	5096
Boston, Massachusetts (A)	862	796	849	5252	4613	4972
Buffalo, New York (A)	1050	940	992	6026	5656	5769
Burlington, Iowa (A)	817	874	822	5680	5710	5463
Burlington, Vermont (A)	1145	994	1107	7201	6382	6739
Cairo, Illinois (C)	487	682	523	3671	3930	3527
Charleston, South Carolina (C)	275	359	260	1796	2253	1726
Charlotte, North Carolina (A)	482	559	449	3045	3429	3004
Chattanooga, Tennessee (A)	540	570	467	3353	3685	3160
Cheyenne, Wyoming (A)	1045	1218	1029	5896	5999	6138
Chicago, Illinois (A)	853	890	868	5669	5498	5516
Cincinnati, Ohio (C)	648	760	645	4188	4370	4110
Cleveland, Ohio (A)	877	907	874	5434	5255	5196
Columbia, Missouri (A)	623	859	698	4583	4902	4632
Columbia, South Carolina (A)	370	463	318	2514	2893	2207
Columbus, Ohio (C)	787	817	741	5042	4932	4694
Concord, New Hampshire (A)	1044	900	1029	6673	5793	6486
Concordia, Kansas (C)	658	971	725	4854	5080	4816
Dallas, Texas (A)	259	470	288	2303	2476	2197
Dayton, Ohio (A)	(a)	893	781	(a)	5276	4938
Denver, Colorado (A)	841	990	843	4960	4922	5240
Des Moines, Iowa (A)	877	933	868	5897	5969	5745
Detroit, Michigan (A)	945	883	927	5778	5465	5527
Devils Lake, North Dakota (C)	1079	1150	1314	8564	7839	8551
Dodge City, Kansas (A)	662	1027	694	4636	4807	4908
Dubuque, Iowa (A)	1054	978	893	6786	6445	6349
Duluth, Minnesota (C)	1223	1137	1352	8463	7753	7929
Elkins, West Virginia (A)	860	932	797	5327	5575	4979
El Paso, Texas (A)	335	422	330	2320	2642	2531
Ely, Nevada (A)	901	1068	921	5722	6125	6120
Escanaba, Michigan (C)	1245	1041	1203	7416	6698	7059
Evansville, Indiana (A)	624	785	589	4367	4578	4013
Fargo, North Dakota (A)	1051	1049	1231	7915	7249	8082
Fort Smith, Arkansas (A)	421	614	418	3233	3391	3037
Fort Wayne, Indiana (A)	885	913	874	5773	5620	5475
Fort Worth, Texas (A)	276	496	308	2406	2659	2266
Fresno, California (A)	219	402	304	1935	2348	2344
Galveston, Texas (C)	137	220	176	1291	1369	1181
Grand Junction, Colorado (A)	728	761	738	4603	4819	5226
Grand Rapids, Michigan (A)	1031	929	1008	6300	6005	6041
Green Bay, Wisconsin (A)	1236	1034	1132	7473	6828	7019
Greensboro, North Carolina (A)	565	675	528	3667	4020	3519
Greenville, South Carolina (A)	469	563	442	2907	3445	2867
Harrisburg, Pennsylvania (A)	773	815	750	4943	4850	4693
Hartford, Connecticut (A)	906	823	871	5725	5204	5365
Havre, Montana (C)	816	1227	1076	7165	6516	7120
Helena, Montana (A)	886	1073	1017	6753	6291	6952
Houston, Texas (C)	(a)	221	166	(a)	1475	1249
Huron, South Dakota (A)	890	1112	1032	7091	6546	6959
Indianapolis, Indiana (A)	803	897	772	5259	5297	4973
Jackson, Mississippi (A)	321	429	299	2371	2734	2121
Kansas City, Missouri (A)	569	828	666	4284	4666	4477
Knoxville, Tennessee (A)	550	586	500	3425	3771	3344
La Crosse, Wisconsin (A)	1114	973	1035	7025	6477	6743
Lander, Wyoming (A)	990	1098	1045	6453	6401	7027
Lewiston, Maine (O)	1036	919	1093	6667	5875	6625

(a) Data not available.

Normal figures in this table are based on 30-year period covering 1921 to 1950, inclusive, as compiled and published by the U. S. Weather Bureau.

Figures in this table, with two exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Co., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively.

Degree-Days for March, 1959 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 31st Year of Publication of Monthly Degree-Day Data

City	March			Season to Mar. 31, incl., from Sept. 1		
	1959	1958	Normal	1958-59	1957-58	Normal
Lincoln, Nebraska (C)	746	918	794	5149	5324	5277
Little Rock, Arkansas (A)	364	562	401	2884	3069	2842
Los Angeles, California (C)	49	246	212	655	795	1235
Louisville, Kentucky (A)	627	754	611	4135	4421	4055
Lynchburg, Virginia (A)	595	730	584	3877	4275	3777
Macon, Georgia (A)	315	345	275	2097	2511	1987
Madison, Wisconsin (A)	1098	955	1011	6960	6411	6342
Marquette, Michigan (C)	1165	1070	1181	7155	6640	6918
Memphis, Tennessee (A)	410	592	427	3049	3428	2974
Meridian, Mississippi (A)	335	379	309	2468	2717	2239
Milwaukee, Wisconsin (A)	1050	977	983	6595	6284	6072
Minneapolis, Minnesota (A)	956	980	1057	6844	6547	6919
Moline, Illinois (A)	861	898	862	5866	5954	5659
Montgomery, Alabama (A)	314	319	288	2093	2524	2057
Nashville, Tennessee (A)	526	643	498	3530	3891	3284
New Haven, Connecticut (A)	871	807	865	5308	4852	5128
New Orleans, Louisiana (C)	143	186	163	1271	1535	1156
New York, New York (C)	768	763	753	4616	4340	4423
Newark, New Jersey	761	752	760	4708	4447	4643
Norfolk, Virginia (A)	478	655	500	3122	3413	3130
North Platte, Nebraska (A)	871	1272	887	5859	5988	5738
Oak Ridge, Tennessee (C)	625	617	633	3669	3786	3743
Oakland, California (A)	240	410	360	1752	2068	2389
Oklahoma City, Oklahoma (A)	481	737	472	3612	3827	3312
Omaha, Nebraska (A)	790	904	831	5521	5579	5559
Parkersburg, West Virginia (C)	724	800	672	4618	4741	4271
Peoria, Illinois (A)	800	868	828	5586	5557	5408
Philadelphia, Pennsylvania (C)	677	724	667	4273	4171	4061
Phoenix, Arizona (A)	66	245	175	1112	1369	1430
Pittsburgh, Pennsylvania (C)	779	818	735	4825	4808	4496
Pittsfield, Massachusetts (A)	1064	982	1060	6703	6179	6475
Pocatello, Idaho (A)	842	897	880	5299	5758	5962
Portland, Maine (A)	1053	889	1039	6737	5714	6406
Portland, Oregon (C)	520	540	515	3136	3050	3500
Providence, Rhode Island (A)	879	816	874	5420	4851	5213
Pueblo, Colorado (A)	772	913	775	4774	4694	5023
Raleigh, North Carolina (A)	504	625	440	3341	3686	2874
Rapid City, South Dakota (A)	833	1057	1045	5946	5819	6359
Reading, Pennsylvania (C)	740	779	725	4758	4589	4510
Red Bluff, California (A)	222	469	336	1827	2582	2318
Reno, Nevada (A)	686	861	756	4581	4895	4946
Richmond, Virginia (A)	542	696	550	3657	3978	3618
Rochester, New York (A)	1073	965	992	6193	5806	5862
Roswell, New Mexico (A)	466	572	443	3328	3395	3211
Sacramento, California (C)	203	410	317	1715	2294	2314
St. Joseph, Missouri (A)	666	863	648	4973	5236	4294
St. Louis, Missouri (C)	573	803	620	4188	4485	4098
Salt Lake City, Utah (A)	722	795	741	4563	4879	5099
San Antonio, Texas (A)	173	289	190	1678	1794	1545
San Diego, California (A)	73	221	223	647	759	1265
Sandusky, Ohio (C)	887	896	853	5481	5321	5088
San Francisco, California (C)	209	359	317	1437	1763	1996
Sault Ste. Marie, Michigan (A)	1306	1046	1302	7931	7098	7671
Savannah, Georgia (A)	257	333	238	1824	2322	1667
Scranton, Pennsylvania (A)	911	946	859	5896	5662	5282
Seattle, Washington (C)	575	539	558	3340	3031	3595
Sheridan, Wyoming (A)	934	1038	1035	6444	5932	6642
Shreveport, Louisiana (A)	287	391	272	2265	2381	2056
Sioux City, Iowa (A)	870	968	930	6182	6004	6231
Spokane, Washington (A)	794	804	234	5415	5034	5770
Springfield, Illinois (A)	719	872	713	5113	5220	4734
Springfield, Missouri (A)	591	866	632	4221	4533	4256
Syracuse, New York (A)	1045	943	955	6278	5776	5637
Toledo, Ohio (A)	914	897	905	5856	5601	5522
Topeka, Kansas (C)	622	851	669	4737	4734	4499
Trenton, New Jersey (C)	744	764	735	4706	4473	4495
Tulsa, Oklahoma (A)	416	696	485	3390	3660	3367
Utica, New York (O)	928	916	989	6272	5805	5955
Valentine, Nebraska (A)	901	1165	970	6279	6159	6140
Walla Walla, Washington (C)	544	619	564	3960	3736	4301
Washington, D. C. (C)	607	726	606	3921	4146	3864
Wichita, Kansas (A)	555	891	619	4327	4606	4183
Williston, North Dakota (C)	941	1217	1194	7789	7078	7836
Winnemucca, Nevada (A)	804	911	794	5021	5301	5396
Yakima, Washington (A)	702	744	660	5013	4645	5172

For footnotes, see page 98.

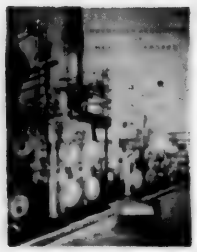
NEW LITERATURE

Use the prepaid postcard on last page for securing your copies of these catalogs.

Packaged Dust Collector

A 20-page product bulletin, No. 272-B, describing the company's Type D Roto-Clone dust collector is published by American Air Filter Co., Inc., Louisville, Ky. The bulletin provides complete product information about unit's application, principle, design, operation, and installation.

Circle **Item 1** on Inquiry Card



Aluminum for Heat Exchangers

Advantages of aluminum usage in heat-exchanger fabrication are described in 16-page publication offered by Reynolds Metals Co., Richmond, Va. Text covers heat transfer rates, tensile strengths, dimensional tolerances, working pressures, thermal expansion, and conductivity.

Circle **Item 2** on Inquiry Card

Compressed Air Filter

Designed for use with compressed air and other gas lines, the Air Line Ultra filter is described in Bulletin No. 1505-7, available from Mine Safety Appliances Co., Pittsburgh, Pa. Bulletin gives specifications and uses; exploded view shows construction features.

Circle **Item 3** on Inquiry Card

Swimming Pool Equipment

Called the most comprehensive book of its kind for pool owners, engineers, Catalog No. 509 is a 48-page data book of swimming pool equipment, supplies, and chemicals. Published by Modern Swimming Pool Co., Inc., White Plains, N. Y., it includes a 4-page section on proper pool care.

Circle **Item 4** on Inquiry Card

Sprayed Coil Dehumidifiers

A 24-page catalog (Bulletin 9427), describing American Blower draw-through and blow-through sprayed coil dehumidifiers, is available from Industrial Div., American-Standard, Detroit, Mich. A section is devoted to principles and applications of blow-through sprayed coil dehumidifiers.

Circle **Item 5** on Inquiry Card

Automatic Colorimetric Analyzers

Bulletin 1156-1, offered by Milton Roy Co., Philadelphia, Pa., describes industrial instruments available for colorimetric determinations of trace quantities of substances dissolved in liquid process streams. Bulletin gives details on analyzers for dissolved silica, dissolved oxygen, and hardness.

Circle **Item 6** on Inquiry Card

Induced Draft Fans

A complete line of induced draft fans is described in 16-page Bulletin L-3, offered by Lehigh Fan & Blower Div., Fuller Co., Catasauqua, Pa. As an aid to engineers, fully-dimensioned charts and drawings of ratings and specifications are presented. Detailed ordering instructions given.

Circle **Item 7** on Inquiry Card

Control Valve

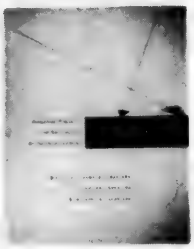
The company's Model 300 three- and four-way control valve is described in 4-page Bulletin 300, offered by W. H. Nicholson and Co., Wilkes-Barre, Pa. Illustrations show operating principle and design features; specifications for the several sizes carried in stock are included.

Circle **Item 8** on Inquiry Card

Magnetic Contactors

Furnas Electric Co., Batavia, Ill., introduces its Class 41 magnetic contactor line with Bulletin 41-B2. Contactors are rated through 10 hp, 220 volts, and 15 hp, 550 volts polyphase; 20, 30, and 40 amps; 2, 3 and 4 poles. Bulletin contains descriptive data, current and horsepower ratings.

Circle **Item 9** on Inquiry Card



Acoustical Products and Services

Four-page Bulletin IT-59 describes Lo-Stat and Standard sound traps, interwall sound barriers, and nationwide acoustical services available from Insul-Coustic Corp., Maspeth, N. Y. Included are photos of recently-completed buildings which employ company's products and systems.

Circle **Item 10** on Inquiry Card

Combustion Control Systems

Explanation and diagrams of typical combustion control systems as applied to stoker-fired boilers are given in 4-page Bulletin 515, available from Bailey Meter Co., Cleveland, Ohio. Both chain-grate and spreader-type stokers are covered; also, a discussion of steam flow-air flow measurement.

Circle **Item 11** on Inquiry Card

Motor Controls

Those who sell, specify, install, maintain or use motor controls will be interested in the new, condensed Motor Controls Catalog No. 14, published by The Arrow-Hart & Hegeman Electric Co., Hartford, Conn. This 80-page catalog gives complete size, weight and rating information.

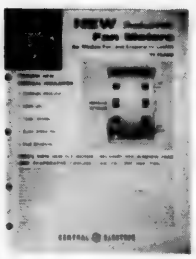
Circle **Item 12** on Inquiry Card

Use the prepaid postcard on last page for securing your copies of these catalogs.

Vertical Steam Boilers

Features of vertical steam boilers are described in Bulletin No. 5215, offered by Sellers Engineering Co., Chicago, Ill. Four-page bulletin includes illustrations, specifications and dimensions of Type H boilers, plus description of company's open return system.

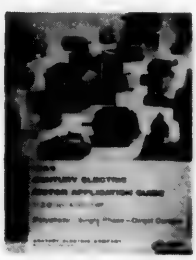
Circle **Item 13** on Inquiry Card



Shaded-Pole Fan Motors

Two-page Bulletin GEA-6891, published by General Electric Co., Schenectady, N. Y., has complete discussion of latest design features of shaded pole "Slim" motors for window fan and evaporative cooler applications. New integral stator insulation now used on these motors is also discussed.

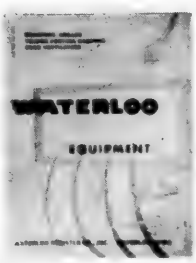
Circle **Item 14** on Inquiry Card



Motor Selection

Century Electric Co., St. Louis, Mo., announces its 16-page 1959 Motor Application Guide. This guide, which has been expanded to include more information about the company's motors and motor applications, has been designed to make motor selection easy. Nine major factors are considered.

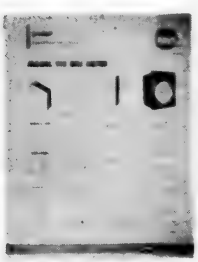
Circle **Item 15** on Inquiry Card



Air Diffusion Equipment

A comprehensive 58-page color-coded catalog, designed for easy and accurate selection of all types of air diffusion equipment, has been prepared by Waterloo Register Co., Inc., Waterloo, Iowa. Catalog includes engineering data on the company's entire line, including removable core grilles.

Circle **Item 16** on Inquiry Card



Btu Meter

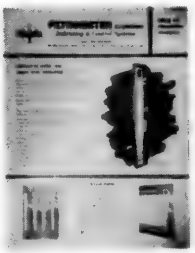
The Hays Corporation, Michigan City, Ind., announces a product specification sheet containing full information, a system schematic, and specification on its new Model 913 Btu meter. Also available are product specification sheets on meter's Universal recorder, flow transmitter.

Circle **Item 17** on Inquiry Card

Expansion Joints

The Garlock Packing Co., Palmyra, N. Y., announces Bulletin AD-137 which describes the characteristics and limitations of several styles of expansion joints and flexible couplings: Spool-type rubber and Neoprene expansion joints, rectangular-type expansion joints, U-type joints.

Circle **Item 18** on Inquiry Card



Level Indicators, Controls

Four-page Bulletin A, published by Petrometer Corp., Long Island City, N, Y., illustrates and describes the company's complete line of liquid level indicators and controls. Included is information on industrial liquid level indicators, fuel oil indicators, dial indicators, truck tank indicators.

Circle **Item 19** on Inquiry Card

Ultraclean Facility

A 4-page brochure, published by Montgomery Engineering Co., Jersey City, N. J., describes a recent company project—an ultraclean facility for the precision production of space-age equipment. It covers environmental control, personnel procedures, and ultrasonic cleaning of parts.

Circle **Item 20** on Inquiry Card

Heat Transfer Products

Brown Fintube Co., Elyria, Ohio, announces a 4-page brochure which describes briefly the major items of heat transfer products the firm manufactures for industry. Products include hairpin heat exchangers; fired indirect heaters; tank heaters for bulk storage tanks; and packaged boilers.

Circle **Item 21** on Inquiry Card

Boiler Water Columns

The Reliance Gauge Column Co., Cleveland, Ohio, celebrates its seventy-fifth year during 1959. Since 1884, company has produced water columns, water level gauges and other equipment, described in Bulletin 516B, to aid steam power plant operators in keeping a safe check on water levels.

Circle **Item 22** on Inquiry Card

Power Tools

A 4-page catalog describing portable construction power tools is announced by Syntron Co., Homer City, Pa. Covered are self-contained electric hammers and hammer drills, featuring automatic drill bit rotation; hammer and hammer drill tools; and belt-driven electric saws.

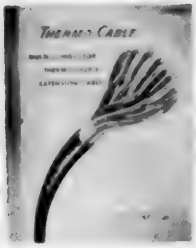
Circle **Item 23** on Inquiry Card

Thermal Insulation

An efficient thermal insulating material, Cafco Heat-Shield, is a blend of refined mineral fibers and inorganic binders. Bulletin I-10, from Columbia Acoustics and Fireproofing Co., Stanhope, N. J., gives specifications, thermal conductivity values, and application data.

Circle **Item 24** on Inquiry Card

Use the prepaid postcard on last page for securing your copies of these catalogs.



Thermocouple Extension Cable

Thermo-Cable, a new type of polyvinyl-insulated, multi-conductor cable for installing 6 to 56 pairs of thermocouple loads at one time, is described and illustrated in 4-page Catalog 33, available from Thermo Electric Co., Inc., Saddle Brook, N. J. Wire resistance tables are included.

Circle **Item 25** on Inquiry Card

Non-Return Valve

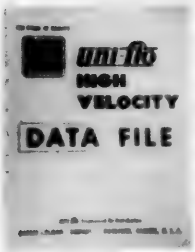
A single-acting, non-return valve is described in an 8-page bulletin issued by Golden-Anderson Valve Specialty Co., Pittsburgh, Pa. Said to be the only such valve that can be tested for operation without dismantling, valve opens automatically when boiler pressure equals header pressure.

Circle **Item 26** on Inquiry Card

Material Extrusion

A 2-page brochure, published by Force-Flo, Inc., East Cleveland, Ohio, describes use of company's Caulk-Flo unit for extruding caulking and glazing compounds, roofing cement, sealants, and adhesives directly from container to point of application in one operation.

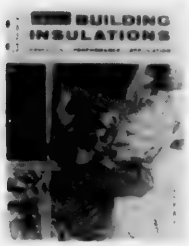
Circle **Item 27** on Inquiry Card



High Velocity Air Distribution

A 52-page data file on high velocity air distribution has been compiled by Barber-Colman Co., Rockford, Ill. Comprehensive file covers such subjects as: What is high velocity, What can high velocity do and where should it be used, Duct design, and Temperature control for high velocity systems.

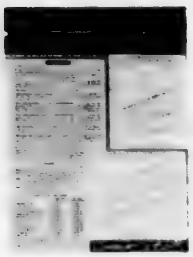
Circle **Item 28** on Inquiry Card



Building Insulations

An 8-page brochure describing and illustrating Fiberglas building insulation has been published by Owens-Corning Fiberglas Corp., Toledo, Ohio. It contains information about company's standard Fiberglas building insulation faced with kraft paper, plus others.

Circle **Item 29** on Inquiry Card



Silencer Selection Chart

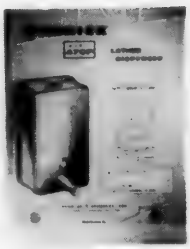
A highly serviceable tool has been created by Elof Hansson, Inc., New York, N.Y., for easier control of noisy air conditioning and ventilating systems. Uni-Silencer selection chart takes guesswork out of fitting right type of silencer to noise problem. Two-sided card is plastic coated.

Circle **Item 30** on Inquiry Card

Electronic Thermometers

Atkins Technical, Inc., Cleveland, Ohio, offers literature describing Thermophil thermistor thermometers, capable of temperature measurements in the range between minus 328 and plus 845 deg F. Brochure lists individual temperature ranges for various models, complete specifications.

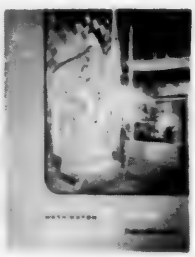
Circle **Item 31** on Inquiry Card



Soap Dispensers

An illustrated catalog sheet describing in detail two soap dispensers for the school market is available from Bobrick Dispensers, Inc., Brooklyn, N. Y. Sheet features comprehensive descriptive and dimensional data on Model 12CP liquid soap dispenser and Model 47CP lather dispenser.

Circle **Item 32** on Inquiry Card



Stainless Steel Specifications

New 36-page book gives detailed information on all commercial stainless steel sheet and strip grades produced by Washington Steel Corp., Washington, Pa. Physical properties and analyses, surface finishes, and suggested applications of various stainless steel types are described.

Circle **Item 33** on Inquiry Card

Electric Heat Thermostats

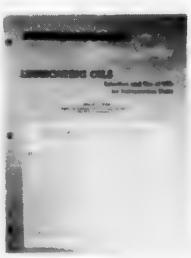
White-Rodgers Co., St. Louis, Mo., has published a 4-page brochure covering its entire line of electric heating controls. The brochure describes each series of the company's controls, including wall-mounted and integrally-mounted types. It shows installation, wiring, and operating principle.

Circle **Item 34** on Inquiry Card

Drawing Filing System

For those who use and store drawings, tracings, prints or maps, of any size and quantity, Hamilton Manufacturing Co., Two Rivers, Wis., offers 8-page bulletin No. ADR-518. It illustrates various cost-saving filing arrangements, and gives installation instructions.

Circle **Item 35** on Inquiry Card



Refrigeration Oils

Complete reference literature on the selection and use of lubricating oils for refrigeration units is available from Industrial Products Dept., Sun Oil Co., Philadelphia, Pa. Adapted from a ten-page article in this publication, material covers essential characteristics of refrigeration oils.

Circle **Item 36** on Inquiry Card

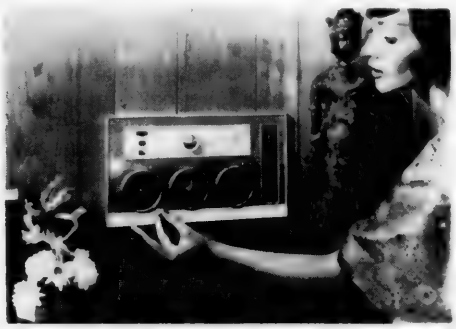
NEWS OF EQUIPMENT AND MATERIALS

Use the convenient prepaid postcard appearing on the last page for securing additional information about new equipment and materials described in this department.

Residential Control Center

A control center for the home is announced by Carrier Corporation, Syracuse, N. Y. Called the Climate Center, the device enables the owner of an air conditioned home to monitor outside weather, control indoor temperatures, and regulate the operation of heating and cooling equipment, all from a single location in the main living area.

Designed for wall-mounting, the 8 by 14 inch satin chrome instrument panel gives constant readings of out-



door and indoor temperatures, barometric pressure and relative humidity; controls both heating and cooling cycles; provides for automatic fan operation and for pre-set adjustments of temperatures during nighttime and daytime hours.

It also flashes warning lights if the filter is clogged, the pilot light goes out, the oil burner fails to ignite, the compressor starts to act up, or the condensate drain is plugged.

More information? Circle Item 37, postcard, last page.

Hydrostatic Shock Control

A new type of water hammer eliminator and hydrostatic shock control, called Hydro-Trol, is announced by Jay R. Smith Manufacturing Co., Union, N. J. Claimed to provide a more efficient and permanently effective method of controlling hydrostatic shock and eliminating water hammer on any hot or cold water piping system, the Hydro-Trol unit features a pressurized design that controls hydrostatic pressure with a combination of pneumatic and hydraulic pressure.

As shock occurs, the stainless steel bellows of the unit expands into a pressurized expansion chamber which provides the displacement required to absorb and control the shock. The bellows is surrounded by hydraulic fluid which, under shock pressure, forms a hydraulic pressure cushion that holds the bellows in alignment and prevents the shock waves from bouncing, which quickly stabilizes the water in the line.

Compact in size and light in weight, unit is available in six sizes. A simplified sizing method is offered, and reported to simplify the selection and specification of the correctly sized shock control.

More information? Circle Item 38, postcard, last page.

Plastic, Cast Iron Pipe Joining

A new fitting which enables plumbers to join Carlon "D" plastic sewer and drain pipe with cast iron pipe by means of molten lead joints is announced by Carlon Products Corp., Aurora, Ohio.

Fitting is easily solvent welded to the plastic pipe. Normal procedure for making a hot lead joint is then followed to obtain a permanent connection with the cast iron. Metal pipe is inserted in the fitting, packed in with oakum, and then wrapped with an asbestos rope. The asbestos is firmly clamped in place and the hot lead poured, as illustrated. Final tamping of the lead insures a tight seal.

More information? Circle Item 39, postcard, last page.

New Corrosion Inhibitor

Development of a corrosion inhibitor in which orthophosphate is added to sodium molybdate is announced by Climax Molybdenum Co., New York, N. Y., a division of American Metal Climax, Inc. The addition is said to permit such smaller dosage of sodium molybdate that use of the latter, long known as an effective, but expensive, corrosion inhibitor, is now commercially feasible.

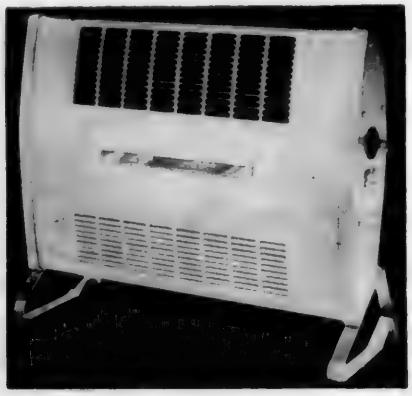
According to the company, this development is expected to find particularly wide acceptance in equipment where toxic materials cannot be used; in particular, in refrigeration systems for food-stuffs, as well as in cooling towers and jackets, recirculating hot water system, boilers, and air conditioning systems.

More information? Circle Item 40, postcard, last page.

Electric Convection Heater

A Chromalox electric convection heater, Type DA, designed for floor or wall mounting, is offered by Edwin L. Wiegand Co., Pittsburgh, Pa. Its sturdy case is made entirely of aluminum, finished in grey hammertone enamel.

All models come equipped with combination brackets for floor or wall mounting and a built-in three heat switch. The 120-volt model is available with 6-ft rubber covered cord and plug and is free-standing for portable use. Heating elements are said to be reliable, all-metal enclosed type, which cannot shock or break and are impervious to moisture.



Warmed air is convected up and out into room at low, gentle velocities, through a safe, close-meshed grille.

Three models are available: DA-15, rated 1500 watts at 120 volts; DA-20, rated 2000 watts, and DA-30, rated 3000 watts, both at 208 or 240 volts. All models are 21 inches high and 8¾ inches deep. Heater is said to be ideal for comfort heating in offices, workshops, garages, recreation rooms, ticket booths and many other applications in the residential, commercial and industrial fields.

More information? Circle Item 41, postcard, last page.

Small Motor 40% More Efficient

A Unitized motor, said to represent a major technological break-through in small component motor design, and be up to 40% more efficient than conventional motors of the same type, has been developed by the General Electric Co., Schenectady, N. Y.

Available first in 4-pole, KSM 59-frame, shaded-pole and permanent-split capacitor ratings up through 1/15 hp. motor is designed for use in such air moving and small machine applications as ventilators, heaters, dehumidifiers, air conditioners, coolers, recorders, projectors, business machines and in many other types of small motor-driven equipment.

Also to be available soon will be Unitized motors in 2-pole, shaded-pole ratings through 20 milli-horsepower and universal series motors of various ratings. A complete line of the motors will become available as designs are developed, according to engineers at the company's Specialty Motor Department, Fort Wayne, Ind.

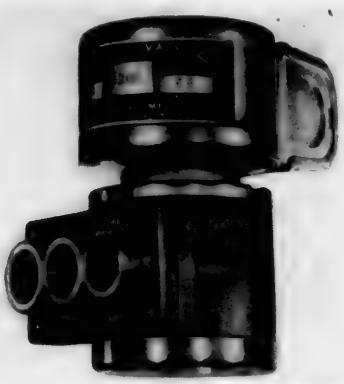
Smaller in size for a given output than motors of traditional design, the Unitized motor will offer the original equipment manufacturer a number of options based upon his motor-driven equipment requirements. Relative to conventional motor design, the new design offers either higher output for the same size, input, and temperature rise; or lower current input, for the same size, output, and temperature rise; or lower temperature rise for the same size, input, and output.

New developments in the bearings, the lubrication system, and the insulation contribute to the over-all life and performance characteristics of the motor. The flexible Unitized motor design can be adapted easily to specific needs of a variety of small motor-driven products.

More information? Circle Item 42, postcard, last page.

Fan-Coil Room Unit Solenoid Valve

Type 701, 3-way solenoid valve for control of fan-coil units using forced-circulation chilled or hot water for individual room air conditioning, is offered by Controls Div., Jackes-Evans Mfg. Co., St. Louis, Mo. In response to thermostat demands the valve diverts water either through the heat exchange coil or by-passes the coil when temperature requirements are met.



The manufacturer states that the unit provides accurate control of temperature in a capacity range from ½ to 10 gpm with a maximum operating pressure of 25 psi (with 200 psi static). Separable solder flange is said to make installation unusually easy. Solenoid utilizes pilot operation and diaphragm amplification, provides maximum flow at low pressure, and eliminates fluid hammer and electrical hum.

More information? Circle Item 43, postcard, last page.

PVC Line Extended

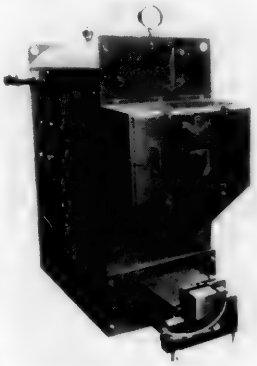
With the addition of 3 sizes, ¼, ⅜ and 1¼ inches, to its line of rigid polyvinyl chloride Y-globe valves, check valves and strainers, Walworth Company, New York, N. Y., now offers these products in a complete range of sizes from ¼ to 2 inches.

PVC products offer exceptional resistance to inorganic salts, alkalis, acids, and other corrosive fluids, and operate successfully at pressures to 150 psi at 75 deg F.

More information? Circle Item 44, postcard, last page.

Gas-Fired Tankless Heater

A gas-fired, twin-coil volume water heater, Series WH, which eliminates the storage tank is introduced by Portmar Water Heater Co., Inc., Brooklyn, N. Y. Claimed to deliver a steady, instant supply of sanitary hot water from twin, tankless copper coils, the unit can fit into small spaces and yet satisfy the hot water requirements of coin operated laundries, commercial laundries, dry cleaning establishments, apartment houses, motels, restaurants, hotels, hospitals, schools, factories, processing plants, etc.



Heater is available in fourteen sizes and delivers from 300 to 6,000 gph hot water. The unit is said to have a rapid recovery rate and its peak efficiency plus built in reserve will meet any excessive demands.

Two temperatures of hot water can be supplied from the same heater: 140 deg F for general use and 180 deg for sterilizer rinse. The company claims that 180-deg water temperature can be reached in a matter of minutes after weekend shutdown. The water heater is complete with gas-fired power burner. It is also available with oil burner and is built to ASME Construction Code.

More information? Circle Item 45, postcard, last page.

New Plastic Flashing

Saraloy 400 is a new elastic flashing material developed by The Dow Chemical Co., Midland, Mich., which, according to the company, is expected to find widespread application in the construction industry, and in particular, in the plumbing field. The product is being marketed after eight years of extensive use tests in a variety of flashing applications.

A black, thermoplastic sheet of vinylidene chloride

copolymer, Saraloy 400 flashings are said to be more effective against water penetration than any other available material. It requires no shop fabrication, and is applicable on the job to most any construction shape and material, including corrugated roofing and siding, vent stacks, and masonry chimneys. The elasticity of the sheet prevents breakage of joints or loss of bonding to the surface of the building as the building expands and contracts with temperature changes.

Besides being effective for the usual roof drain, ventilator base, and cap and base flashing applications, the product is said to be equally effective for expansion joints, fascia coverings, and interior flashings, both industrial and residential.

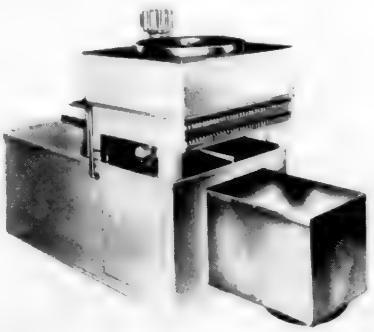
The sheet will form a seal around nails driven through it, is chemically resistant to gas, oil, acids and alkalies, will not rust, is resistant to fire, and has a paintable surface. Also resistant to abrasion and tearing, the flashing is nevertheless easy to cut to size on the job with a sharp knife or heavy-duty scissors. It can be solvent-bonded to itself to form permanent joints.

The elastic flashing is shown installed in a shower, at the home of J. B. Duke, Ann Arbor, Mich., roofing contractor, laid on top of 3 inches of concrete. A 2-inch layer of concrete was subsequently laid on top. Even though the floor of the shower area has settled approximately an inch during the past six years, the shower pan is still completely free from leakage, the company states, due to the flashing's elasticity, which has kept the material tightly bonded to the concrete.

More information? Circle Item 46, postcard, last page.

Roof-Mounted Year-Round Unit

Announced by Typhoon Air Conditioning Co., Div. of Hupp Corp., Brooklyn, N. Y., is a roof-mounted unit which is a combination heating-cooling system. Designed for year-round conditioning of single-story commercial or industrial structures, it consists of a cooling system, a gas-fired heating unit, air filters, blower and controls, all enclosed in a heavy duty all-weather casing.



An air distribution plenum and diffuser for carrying conditioned air to, and return air from, the building interior is furnished as part of the standard package. Designed for front duct connection, as illustrated, the unit may be located anywhere on a roof, not necessarily directly over the space it serves.

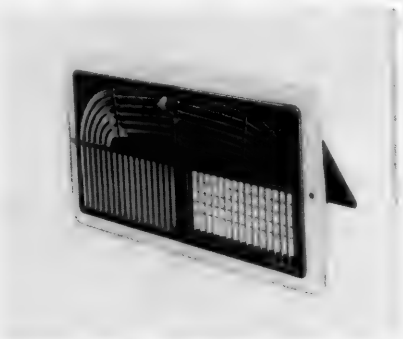
Available in 5- and 8-ton models, the unit has a propeller-type fan and vertical air flow not affected by wind velocity.

More information? Circle Item 47, postcard, last page.

Sidewall Perimeter Diffusers

A new line of sidewall perimeter diffusers, featuring four-way air pattern control, is announced by Air Control Products, Inc., Coopersville, Mich.

Fins on the No. 25 sidewall (illustrated) and No. 26 baseboard perimeter diffusers are factory-set to provide a perfect air pattern for typical sidewall perimeter diffuser locations, the company reports. In addition, vertical and horizontal fins are adjustable, allowing any air pattern adjustments necessary to meet unusual installation requirements.



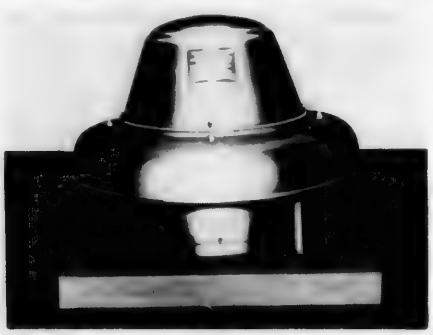
Finished in two-tone beige baked enamel, the diffusers are offered in two sizes—10 x 6 and 12 x 6. According to the company, prices are comparable to standard sidewall diffusers not offering the exclusive fin adjustment feature.

More information? Circle Item 48, postcard, last page.

Spun Aluminum Roof Ventilators

A line of direct-drive aluminum spun roof ventilators is announced by Fan and Blower Div., The Peerless Electric Co., Warren, Ohio. Wheel diameters run from 7¾ to 15 inches; and capacities range from 138-2950 cfm.

The attractive, low-contour roof ventilator is said to be ideally suited for exhausting air from churches, schools, kitchens, lavatories, and other areas where a low silhouette is desired. Manufactured completely of heavy-gage aluminum, the ventilator combines a very low contour with a large exhaust area. Wheels are all-aluminum with self-limiting horsepower. They are dynamically balanced, both before and after assembly.



All standard units of the ventilator line are directly driven with quietly operating, permanent split-capacitor-type motors. The motor, wound for 115 volt, 60 cycle, single phase current, is located in a separate compartment and is completely out of the air stream. Bearings are permanently sealed and lubricated for life. Operating parts are suspended on rubber mounts. The hood is easily removed for motor inspection.

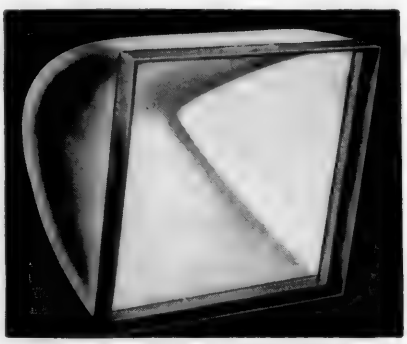
Ventilator may be furnished with a disconnect switch, special acid-resisting paint and special motors. Automatic or motorized, curb-mounted shutters are also available.

More information? Circle Item 49, postcard, last page.

Parabolic Filter Holds More

A parabolic shaped, disposable, bag-type filter, designated B/T Pure-Air Filter, is specifically engineered for air conditioning, heating, and ventilating systems by Arco Mfg. Corp., New York, N. Y.

In design and material, the filter is new. Filtering action is strongest where the dust particles are finest. Airflow is strongest where the accumulation of large dust particles is greatest. The least resistance to air flow is at the back of the bag, gradually increasing up the sides.



Large particles of dirt in an air stream cannot change direction because of inertia, so they lodge at the back of the parabolic filter bag. The fine, microscopic particles do change direction, and are deposited on the sides. But the air travels through the sides of the bag at an angle, so it goes through a much greater thickness of material, increasing filtering efficiency, the company explains.

The material of which the filters are made has upstanding fibers on its surface. This is said to help promote the formation of a pervious filter cake. As the filter cake builds up, the air stream hits it at an angle, breaks it off, and carries it to the back of the bag.

According to the manufacturer, the parabolic bag has higher average efficiency than viscous-coated types and dirt-holding capacity is unusually great. Resistance is 0.10 inches w.g. at 350 fpm 0.15 inches w.g. at 520 fpm. Low initial resistance makes it adaptable to low or high velocity systems.

Installing the filter, which weighs only a few ounces, is done without supporting or loading devices. The mouth of the filter has a stiff fiber frame which facilitates insertion and removal. Filter fits most filter banks with a downstream clearance of 18 inches.

More information? Circle Item 50, postcard, last page.

Indicating Temperature Controller

Combining magnetic amplifier and transistor circuitry, a new Limitemp (TM) indicating temperature controller, available from Westinghouse Electric Corp., Pittsburgh, Pa., monitors and controls temperatures within the range of 100 to 400 deg F with extreme reliability. The device uses no electronic tubes. Models for higher temperature ranges will be available soon.

Accuracy for temperature control is plus or minus 3 deg about the level selected; accuracy for indication by meter reading is plus or minus 6 deg. An integral indicating lamp signals whenever the controller is functioning to restore temperature to the level desired.

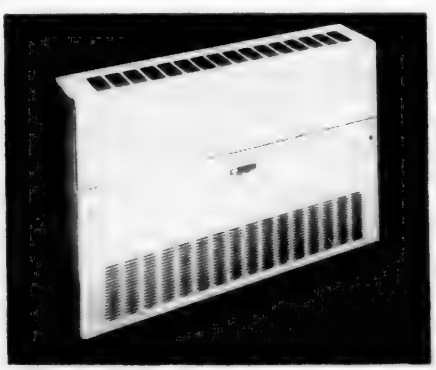
Typical applications will be to monitor temperatures of bearings, windings of large motors and other electrical equipment, and materials in process. Power output of the device is 5 watts at 24 volts d-c, a level suitable for driving high-power static amplifiers, auxiliary relays, and other industrial control equipment.

More information? Circle Item 51, postcard, last page.

Electric Cabinet, Unit Heaters

Series AE cabinet electric heaters and seven newly designed electric unit heaters are announced by Ilg Electric Ventilating Co., Chicago, Ill.

Included in the cabinet line are two blow-through units with direct-drive fan assemblies and a draw-through model with V-belt-driven fan assembly. Units are available for floor, ceiling, wall or inverted mounting, and can be non-recessed, semi-recessed or concealed as desired.



Cabinet units have nonglowing finned strip elements individually housed in heavy-gage galvanized steel closers. Wiring is enclosed in flexible metallic conduit throughout. A high-limit cutout is provided to protect against overheating. For longer element life, a fan switch provides fan operation until all heat is dissipated. All air is filtered prior to entering fan and heating elements. Both permanent and renewable type filters are available. Three types of control are available: manual, pneumatic, and automatic electric. Its electric unit heater line is increased in capacity from 7½ to 36 kw. Company engineers state that the new units feature black-heat type elements which are individually replaceable, new safety design which eliminates bare wires and terminals in the air stream, and company's totally enclosed motor with quiet type fan wheel. Designed for office, store, and industrial use, units are finished in green enamel and cover a heating range to 122,832 Btu.

More information? Circle Item 52, postcard, last page.

Low Pressure Relief Valve

No. 38 low pressure relief valve, announced by H. A. Thrush & Co., Peru, Ind., has an ASME and National Board rating of 520,000 Btu. The ¾-inch inlet by ¾-inch outlet safety valve operates as a dependable water relief valve, yet it ably relieves steam conditions, the company states.

Working parts are all brass. Silicone seat is heat resistant and non-sticking. Of high capacity, valve is so designed that there is positive shutoff after discharging and its heat-resistant diaphragm protects the spring from water corrosion at all times. Safety features are said not to be diminished even after discharging water or steam many times.

The valve is also available in four high pressure settings with ASME ratings from 75-150 lb; 1,040,000 to 1,940,000 Btu, in which case it is renamed the No. 81.

More information? Circle Item 53, postcard, last page.

Replacement Blower Bearings

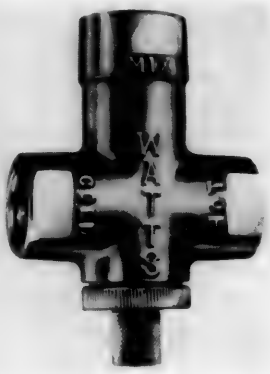
Replacement blower bearings used in forced-air heating and cooling units are available in kits, complete with installation and lubrication instruction, from Randall Graphite Bearings, Inc., Lima, Ohio.

For the first time, the company reports, heating and air conditioning repairmen can select and buy over the counter the proper replacement bearing by means of a simplified guide and a foolproof series of diagrams which are color-keyed to the bearing specifications of leading original equipment manufacturers. This guide also specifies which of the kits are interchangeable with other types of bearings. These 16 bearings are available for standard shaft sizes from ½ to 1-inch diameter.

More information? Circle Item 54, postcard, last page.

Three Tempering Valves

Three adjustable tempering valves are announced by Watts Regulator Co., Lawrence, Mass. The 70T, with threaded connections, is available in ½ and ¾-inch sizes. The ¾-inch No. 70, with sweat connections, joins a previously-announced ½-inch sweat connection model to provide a selection for almost every requirement.



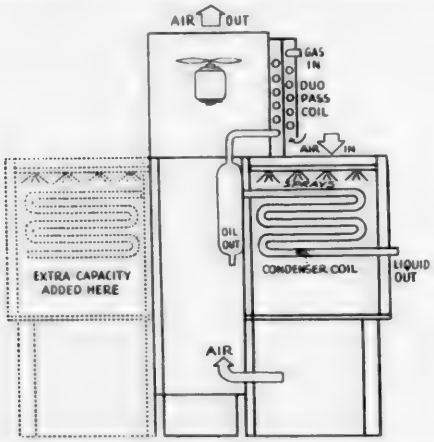
The new valves feature a powerful, sensitive thermostat, all bronze body, and leak-proof O-rings. A slotted seal cap doubles as a handy screwdriver for adjusting any of the three valves.

More information? Circle Item 55, postcard, last page.

Evaporative Condensers

A line of refrigerant evaporative condensers applicable to ammonia or halogen refrigerants is announced by Niagara Blower Co., New York, N. Y.

The distinctive feature of the new equipment is that the components—condensing coils, casing sections, and spray equipment—are organized and sized as a line of standard units that can be assembled as machines to fit close to the actual capacity needs of an existing refrigeration plant, or made provision for plant expansion directly according to the load requirements. As a result, condensers are available in sizes from 10 to 190 tons refrigeration capacity in increments of 10 tons in each of the intermediate sizes. From 200 to 350 tons there are sizes available at each 25-ton increment, resulting in much economy in the installation, the company states.



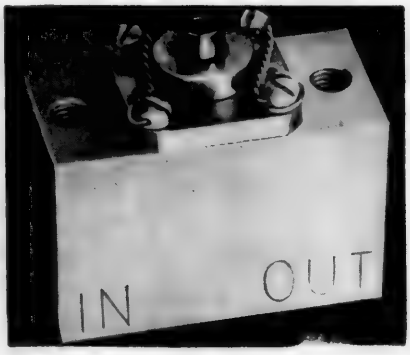
These evaporative condensers use the evaporation of sprays on condensing coils to remove the heat of condensation at the rate of 1000 Btu per pound of water evaporated, resulting in hardly more than nominal water consumption. Condensers are equipped with the company's Duo-pass precooling coil to remove the superheat from the hot gas before it reaches the condensing coils, resulting in the avoidance of scale. Between this coil and the condensing coils is the company's Oilout separator to remove crank-case oil from the system at the most advantageous point.

The standard units are easily assembled and erected in the field. All components being detachable at any time, maintenance is greatly simplified and made much less expensive with the provision for immediate access (by removing one panel only) to all interior parts, for complete inspection.

More information? Circle Item 56, postcard, last page.

Differential Pressure Indicator

Aircraft Porous Media, Inc., Glen Cove, N. Y., subsidiary of Pall Corporation, announces availability of the Deltadyne, a device which raises a red button to view when the differential pressure in a system exceeds a stated value. Unit is activated by differential pressures as small as 5 psi in systems with internal pressures as high as 5000 psi.



This 1 by 1¾ by 2-inch device, weighing 0.27 lb for use in minus 65 to plus 275 deg F systems can be used to detect clogging of filters, spray nozzles, and injection nozzles. It also will report excessive pressure drop in any part of a hydraulic or other fluid system. It can also be used in conjunction with an orifice or other flow restrictor to detect insufficient or excessive flow.

More information? Circle Item 57, postcard, last page.

Gas-Fired Water Heater

A new gas-fired water heater, the Burkay 668, has been added by Permaglas Div., A. O. Smith Corp., Kankakee, Ill., to its commercial line. The unit, with an input of 300,000 Btu per hr, rounds out the company's line of coil-type commercial heaters.

Water heater is suited for use in apartment and office buildings, laundries, industrial plants, schools, and restaurants. In restaurants it may be installed as a straight recovery heater, as a booster heater, or as part of an A. O. Smith-Burkay Booster Recovery or Shure-Temp Booster Recovery system. It is also available as a swimming pool heater with self generating controls and flow switch.

More information? Circle Item 58, postcard, last page.

Pipe-Fitting Insulators

Insul-Sure molded Fiberglas pipe-fitting insulators are offered by Insul-Coustic Corp., Maspeth, N. Y. They are said to offer ease of installation; insulating efficiency; neat appearance; immunity to rust, rot, and corrosion; and net cost savings, compared to conventional methods.

Fittings are installed by placing its two halves over the pipe fitting, and stapling, wiring, or taping the sections together.

Sizes available are: Standard (1 inch) thick, ½ to 8 inches, screwed fittings, 2 to 8 inches welded fittings; Extra (1½ inch) thick, ¾ to 8 inches, screwed fittings, 2 to 12 inches, welded fittings.

In addition to ease of installation, fittings are removable and replaceable, in case repairs are needed on the insulated line. Also, the uniform finish of these insulators is said to make it easy to cover them with canvas, mastic coatings, or paint. They are not affected by moisture, and are suitable for operating temperatures to 450 deg F, the company states.

More information? Circle Item 59, postcard, last page.

Air Purifier for Gas Conditioner

Availability of an ultraviolet air purifying attachment for its Arkla-Servel Sun Valley residential gas air conditioners is announced by Arkla Air Conditioning Corp., Little Rock, Ark. Unique in the residential air conditioning field, it has the dual purpose of substantially reducing both bacteria and home odors present in the circulating air stream.

The company said the device will be optional on its 1959 all-year gas units. Consisting of two tubular ultraviolet lamps and related equipment, it also is available in kits for ready installation on existing Sun Valley systems.

Extensive tests have shown the attachment will result in a bacteria "kill" of about 75%, it is said, roughly the purity of most outside air. At the same time, it will substantially remove odors, like those caused by cooking or tobacco smoke. Germ removal is accomplished by subjecting the circulated air to ultraviolet rays. Odor reduction is achieved by simultaneously producing ultraviolet rays of another wave length which generate ozone. By a chemical reaction, the minute, but effective, quantity of ozone produced literally "burns up" odors.

This process already has proven itself as a highly effective germ killer, the manufacturer states. Surveys have shown, for example, that the use of ultraviolet radiation in hospital operating rooms has reduced post-operative infection by over 85%. At a school in New York State, it cut down pupil absences due to illness by 66%.

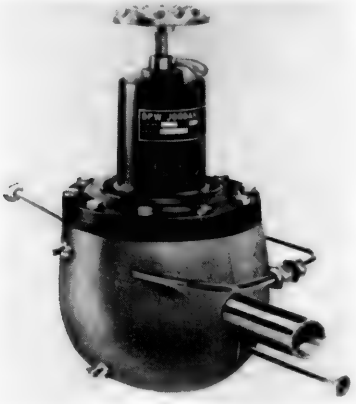
The purifying equipment in the air conditioner is mounted in the blower section, where the circulated air receives maximum ultraviolet treatment. Each of the two sterilizing lamps consumes about 15 watts of current.

More information? Circle Item 60, postcard, last page.

Jacketed Regulators

Thermon jacketed regulators are available from OPW-Jordan, Cincinnati, Ohio. The sliding gate regulators with Thermon jackets are used to solve industrial heat transfer problems associated with viscous or hard-to-handle fluids.

Jacketing surrounds steam tracing lines and keeps fluids from hardening or solidifying. Said to be more efficient than conventional tracing and less expensive than steam jacketing, they are easily removed for access to regulator and work equally well for heating or cooling applications.



Regulators are suitable for pressures to 250 psi and temperatures to 406 deg F, are available from ¼ through 6 inch sizes.

More information? Circle Item 61, postcard, last page.

Compact Water Cooler

Kelvinator Water Coolers, Columbus, Ohio, announces its Model A3P Bubbelet water cooler, an addition to its All American Series, which occupies only one sq ft of space but produces 3 gph of drinking water. An attractive gray cabinet harmonizes with all furnishings. The manufacturer suggests these units for offices, service stations, and reception rooms. Several can be strategically located in larger offices to reduce time spent walking to and from a single, larger water cooler.

More information? Circle Item 62, postcard, last page.

Steam-Driven Centrifugal Chiller

The Trane Co., La Crosse, Wis., announces further expansion of its CenTraVac centrifugal water chiller line to include a steam driven machine. The new unit, called the Turbine CenTraVac to distinguish it from the electrically-driven Hermetic CenTraVac, is available in capacities of 200 to 1600 tons for comfort or process applications.

Unit is a single-stage centrifugal water chiller which employs an integral shaft design. The compressor impeller is mounted on the turbine shaft and is supported by turbine bearings. The one-piece compressor and steam driver are factory assembled on a common baseplate. This and the two other major components of the unit are match-marked at the factory. Installation is basically a matter of rigging and can be done by any competent mechanical contractor.

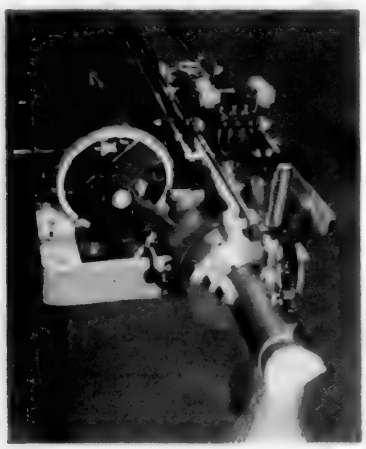
Power is supplied by a multi-stage turbine selected with steam conditions of 125 psi inlet, zero degree superheat, and 26-inch vacuum exhaust as standard. Turbines are available for other steam conditions, and can be selected for either condensing or non-condensing operation.

More information? Circle Item 63, postcard, last page.

Contour-Cutting Machine

An improved contour-cutting machine, said almost to think for itself, is announced by Steffan Mfg. Corp., Salem, Ohio. According to the manufacturer, its use will save up to three-quarters of the time and material for joining pipe and fabricated parts.

Cutter is designed to practically eliminate the use of forged fittings. Initial set-up takes as little as 15 sec.



Cutting at a rate of 20 inches per min, a 6-inch aluminum pipe can be contoured in only 20 seconds, the company states.

Pipe is clamped into a 3-jaw chuck and pertinent information fed into the controlling mechanism. Pushing a button activates the action and the most complex contour is automatically cut without the use of templates, layouts or patterns.

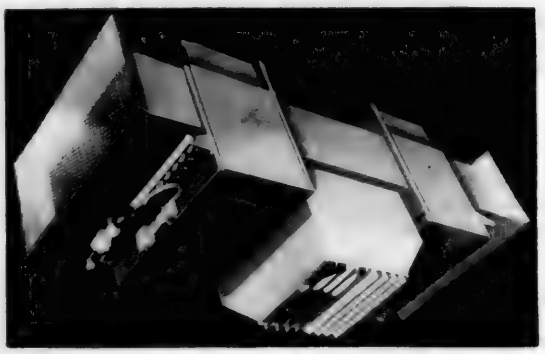
Sections requiring straight, mitered or contoured ends are quickly prepared with proper bevels for welding. The cutting head is equipped with an oxyacetylene torch for cutting carbon steel or a Linde Heliarc for cutting aluminum, stainless steel, copper, cast iron, magnesium, and high-alloy steels.

Optional equipment widens the range of uses. A companion piece, operating on the same principles, is available for cutting holes, circles and elipses. Various models of the cutter allow the operator to handle pipe from 2 to 24 inches in diameter.

More information? Circle Item 64, postcard, last page.

Gas Heaters for High-Ceiling Jobs

Heating in buildings with high ceilings or obstructions can be successfully accomplished with the Downflow direct-fired gas heater, states its producer, Reznor Mfg. Co., Mercer, Pa. Examples include airplane hangars, field houses, warehouses and various manufacturing plants. Equipment is designed to be installed up to 40 ft above floor level.



The direct-fired units are available in four basic sizes from 300,000 to 600,000 Btuh. Units can be installed in multiples to provide greater capacities. Heater consists of duct furnaces with automatic controls, a large propeller-type fan assembly, and screened, bell-mouthed intake boots. Standard specifications include aluminized steel heat exchangers and on-off gas valves with 115- or 230-volt controls. Louvers may be adjusted to provide air distribution to specific areas or for spot concentration.

Stainless steel heat exchangers and electric ignition are optional. Also available is a four-way diffuser for hemispherical distribution over a wide area. For milder weather conditions, gas modulation from a 60% to 100% range can be provided.

More information? Circle Item 65, postcard, last page.

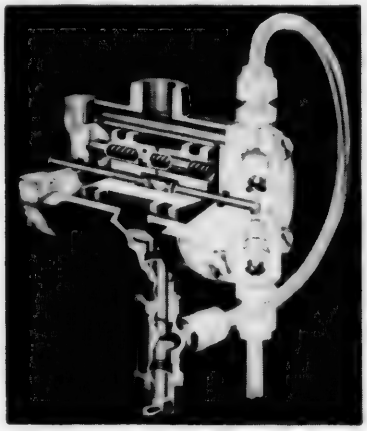
New Drafting Film

Tru-Trace is a new drafting film announced by J. H. Weil Co., Philadelphia, Pa. Based on DuPont Company's Mylar Polyester film, it is transparent and flexible. According to the manufacturer, neither the Mylar film or the drafting surface applied to the base film have any plasticizer which can leave the sheet and thus embrittle the sheet with age. Film is available in four thicknesses.

More information? Circle Item 66, postcard, last page.

Chemical Feed Pump

A positive displacement chemical feed pump for water purification and treatment is developed by The F. E. Myers & Bro. Co., Ashland, Ohio. It automatically uses undiluted liquid bleach to make water safe for consumption, and can also be used as a polyphosphate feeder for combating excess iron in water, the company states.



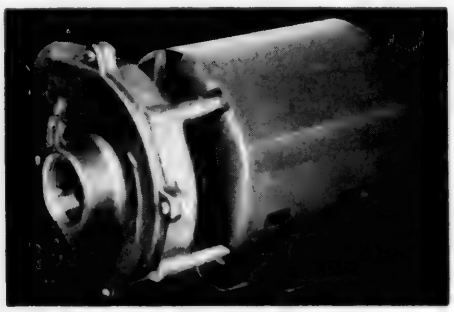
According to the manufacturer, the pump, once regulated, is extremely accurate in maintaining the proportion of chemical solution to the water flow. Strokes per minute are directly proportional to gallons per minute of water treated. Up to 3,000 gph can be treated. Brass, monel, or stainless construction throughout.

More information? Circle Item 67, postcard, last page.

Small, Lightweight Pump

A direct connected centrifugal pump, designed specifically for small cooling tower and chilled water applications, has been introduced by The Triangle Mfg. Co., Detroit. Mich. The pump, trade-named Cool-Flo, is distributed exclusively by Thermalair Engineering Co., Detroit. Mich. It is of non-ferrous construction and is provided with a high quality mechanical seal, the company states.

Available with ¼ or ⅓-hp, 3450-rpm, 110- or 220-volt, 60-cycle, 1-phase General Electric motor, with rubber-mounted base and built-in thermal protection, pump



has a 1¼-inch FPT suction connection and 1-inch FPT discharge connection. The ⅓-hp pump capacity varies from 40 gpm of water at 22 ft head to 2½ gpm at a 34 ft head. The direct connected impeller eliminates bearings in the pump so that the entire assembly is only slightly larger than the motor itself. The company claims that its pump is the smallest, lightest-weight low-cost pump of its capacity available.

A ⅛-inch pipe plug in the cover plate permits draining and air purging. The pump can be rotated to any discharge position by loosening latch-bolts on the motor and the all-brass construction features a non-clogging type one-piece brass impeller mounted directly on the motor shaft. The motor shaft is enclosed in the wheel hub and protected by the shaft seal.

More information? Circle Item 68, postcard, last page.

Heater Has Aluminum Tank

Electric water heaters of aluminum, marketed under the National Alumidure label, are being manufactured by National Steel Construction Co., Seattle. Wash. The tanks are constructed of aluminum alloy having an ultimate tensile strength of not less than 40,000 psi and the corrosion resistance of alloy 7072 material. Tanks are tested to 300 psi hydrostatic pressure and guaranteed to 127.5 psi working pressure.

Immersion type thermostats and heating elements are removable without draining the tank. Each tank is equipped with a magnesium anode. Tank insulation is 2½ inches thick, over which is installed a steel jacket finished with high-grade baked enamel. The National Alumidure line, fabricated from Kaiser Aluminum, includes round models with capacities of 40, 52, 66, 82 and 100 gal. In addition, table top models of 40 and 52 gal capacity are in production.

More information? Circle Item 69, postcard, last page.

Extends Packaged Fire Tube Line

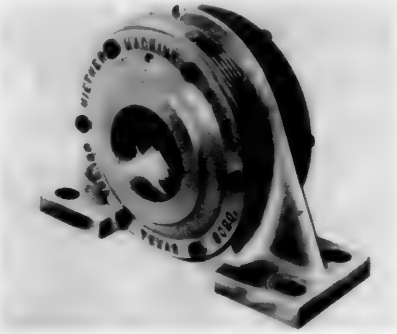
Extension of its C-B packaged fire tube boiler line to include units of 400, 500, and 600 hp is announced by Cleaver-Brooks Co., Milwaukee, Wis. They are said to be designed especially for heating and processing steam or hot water for larger commercial, industrial, and institutional applications, such as schools, hospitals, hotels, office buildings, factories, and shopping centers.

The line now ranges from 15 to 600 hp with 18 sizes and 90 models. Units are available for high or low pressure steam and can be fired with oil, gas, or combination oil-gas. Each unit is fully factory tested prior to shipment, while each boiler is started, adjusted, and the operator instructed in the field by highly trained company servicemen.

More information? Circle Item 70, postcard, last page.

Versatile Pillow Block Line

A new line of pillow blocks, accommodating all series of spherical roller bearings, is said by the manufacturer, Miether Machine Works, Odessa, Tex., to offer new versatility for heavy industrial use. Through interchangeable end caps, twenty basic housings in this line will accommodate 94 separate bearings. Some housings take as many as eight different bearing sizes and up to 11 separate shaft diameters.



To install a different bearing size, it is necessary only to fit new end caps on the housing. End caps and housings are jig drilled for perfect interchangeability. According to the manufacturer, this feature makes the pillow blocks more adaptable to a change-over or new installation.

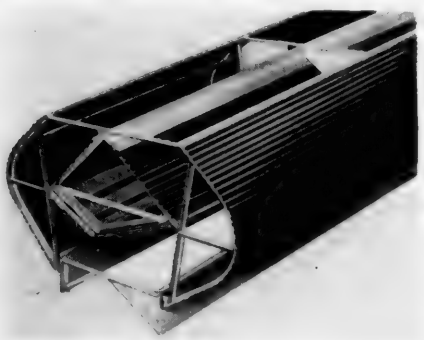
For further versatility, housings are center-grooved for universal center lubrication (W-20 and W-33 specifications), and end caps have a second connection for side lubrication. Either labyrinth closures or oil seals are available on most caps.

More information? Circle Item 71, postcard, last page.

Gravity Roof Ventilators

Sleek-Line continuous gravity roof ventilators for large volume exhaust from buildings where large furnaces or other heat or fume creating equipment are used in production processes are announced by E. Van Noorden Co., Boston, Mass.

With throat sizes from 36 to 96 inches, these ventilators are capable of exhausting up to 12,000 cfm for each



10 ft of length. They are designed to operate regardless of wind direction and are engineered to withstand hurricane, wind, and snow load. Suitable for any type roof, their styling is said to be appropriate for all types of industrial buildings.

Ventilators are available in a choice of aluminum, galvanized iron, or protected metal skin, with painted steel, hot dipped galvanized or aluminum braces. Special coatings are also available. Positive exhaust control is provided by standard chain- or motor-operated butterfly dampers, and in addition fusible link and manually operated pivoted dampers may be specified.

More information? Circle Item 72, postcard, last page.

Pressure Reducing Valve

A steam pressure reducing valve employing an entirely new concept, mechanical pilot operation, has been developed by Leslie Co., Lyndhurst, N. J.

The valve design employs a mechanical pilot device which is entirely out of the path of steam and therefore eliminates troublesome dirt catching and close fitting parts. It has been thoroughly field tested for continuous, intermittent and standby services. Test of the valve performance compared with other types of steam pressure reducing valves show a flat capacity-regulation characteristic indicating close control throughout the operating ranges of the valve, the company reports.

More information? Circle Item 73, postcard, last page.

Enters Air-Cooled Field

New air-cooled condensers with nominal capacities from 15 to 100 tons (nine models) are being marketed by The Marley Co., Kansas City, Mo., under its tradename, DriCooler. In designing the DriCooler, the company extends its engineering experience, research, and development in industrial air-cooled heat exchangers to the air conditioning and refrigeration field. As a result, the condensers are said to embody many desirable features and advantages, including ease and flexibility of installation, durability, and all-season full performance.

Condensers are horizontal units with vertical blow-through air flow from a single industrial-type fan. This design eliminates fan wind-loading by adverse air currents and minimizes recirculation. Air turning vanes and supplementary hoods are never required, assuring unobstructed air flow and minimizing plan area requirements.

All units have angularly mounted modular condenser coil sections forming a plenum chamber that equalizes air pressure over all areas of the coil sections, eliminating fringe areas of reduced heat transfer.

More information? Circle Item 74, postcard, last page.

(Continued on page 114)

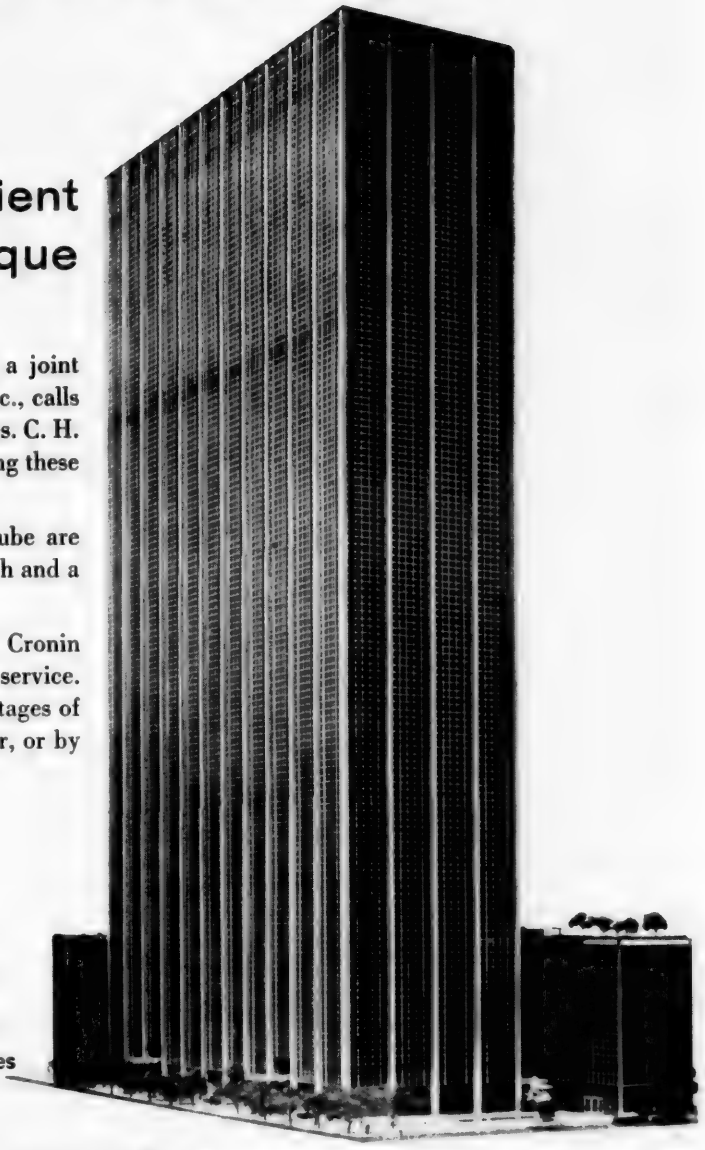
CHASE® COPPER TUBE
in the new TIME & LIFE building

Contractor uses efficient prefabrication technique

THE NEW $70 MILLION TIME & LIFE building, a joint venture of Rockefeller Center, Inc. and Time Inc., calls for the use of many duplicate plumbing assemblies. C. H. Cronin, the Plumbing Contractor, is prefabricating these units *on the job site.*

The prefabricated units of Chase® Copper Tube are made quickly and installed easily with just a torch and a level... a neat and efficient installation.

Because he uses *quality* Chase Copper, Mr. Cronin knows his installations will give long, trouble-free service. *You* can get full information on the many advantages of using copper from your nearest Chase wholesaler, or by writing Chase at Waterbury 20, Connecticut.



Architects: Harrison & Abramovitz & Harris
General Contractors: George A. Fuller Company
John Lowry, Inc.
Plumbing Contractor: C. H. Cronin Incorporated
Chase Wholesaler: New York Plumbing Specialties

Job-site prefabrication of 20′ headers of Chase Copper Tube.

Prompt Delivery on the job site meets tight production schedules.

Chase
BRASS & COPPER CO.
WATERBURY 20, CONN.
Subsidiary of ***Kennecott Copper Corporation***

THE NATION'S HEADQUARTERS FOR ALUMINUM • BRASS • BRONZE • COPPER • STAINLESS STEEL
Atlanta Baltimore Boston Charlotte Chicago Cincinnati Cleveland Dallas Denver Detroit Grand Rapids Houston Indianapolis Kansas City, Mo. Los Angeles Milwaukee Minneapolis Newark New Orleans New York (Maspeth, L.I.) Philadelphia Pittsburgh Providence Rochester St. Louis San Francisco Seattle Waterbury

Custom Made

AIR DIFFUSERS with DIFFUSING VANES

Each AGITAIR square and rectangular air diffuser is custom designed to meet your requirements of air flow and interior treatment.

These AGITAIR diffusers have built-in diffusing vanes, scientifically arranged in unlimited louver patterns to provide certified 100% draftless air distribution from any ceiling or wall location.

AGITAIR Catalog R-107 shows you how to select the proper size and pattern for your job conditions.

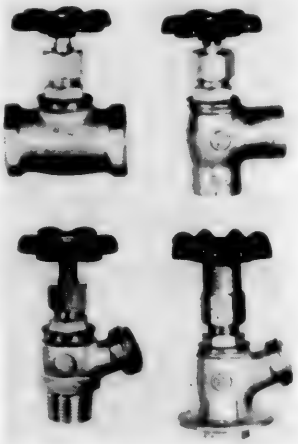
Write for your copy today.

AIR DEVICES INC.
185 MADISON AVE., N. Y. 16, N. Y.
air diffusers • filters • exhausters

(Continued from page 112)

New Valve Line Announced

Its Full-Flo valve line, consisting of twelve new patterns of stop, stop and waste, angle stops, boiler drains, and sill cocks for iron pipe and copper tubing, is announced by Hammond Valve Corporation, Hammond, Ind.



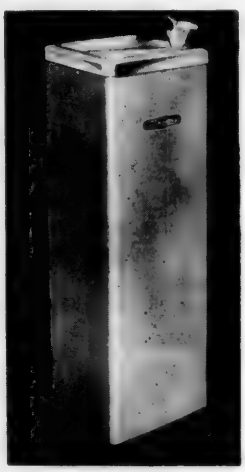
Illustrated, left to right, top line, are the No. 445 stop valve and the No. 466 angle stop. At bottom of photo, left to right, are the No. 710 boiler drain and the No. 1026 sill cock.

Valve line will feature full flow throughout with full port openings, a quick opening and closing feature, and back seating under pressure to allow repacking when fully open. Valve will be available in ½ and ¾ inch sizes.

More information? Circle Item 75, postcard, last page.

Cooler Has One-Piece Stainless Top

An improved version of a high-efficiency electric water cooler that provides large cooler capacity in one sq ft of floor space is introduced by Cordley & Hayes, New York, N. Y. This latest Model H-3S cooler has an 18.8 one-piece stainless steel, splash-proof drinking top. The top has an easy-to-remove grid for cleaning the drain pipe and an electrolytically polished finish that resists spotting.



Designed especially for small offices, stores and industries, the unit comes in a compact steel cabinet 12 inches square by 38 inches high, and is finished in either neutral gray or gleaming white baked enamel. It delivers enough perfectly cooled water to serve thirty-five persons per hour. An accessible thermostat with 10 deg F range provides for controlling the drinking water to the temperature desired.

Refrigeration system is hermetically sealed for life and never needs oiling. It is covered by the company's 5-year guarantee. Installation is made simple and economical by a drain tube furnished as standard equipment. Power supply is 50 or 60 cycles at 115 volts with a plug-in transformer adaptable to 230 volts available.

More information? Circle Item 76, postcard, last page.

(Continued on page 116)

BUY FROM THESE COMPLETE LINES OF

SARCO AND SARCOTHERM

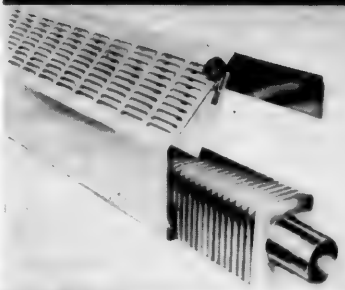
heating specialties—
and get undivided responsibility for performance

SARCO CONDENSATE AND VACUUM PUMPS

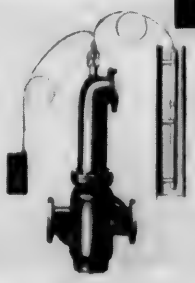
Use this one completely reliable source for

Complete weather compensated control systems . . . heating specialties . . . pumps . . . radiator traps . . . all five types of steam traps. Write for detailed catalog information.

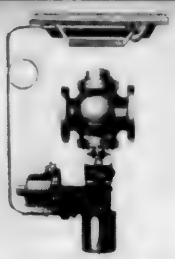
SARCOFIN FINNED-TUBE AND BASEBOARD RADIATION



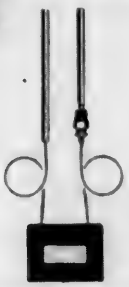
SARCOTHERM WEATHER-COMPENSATED CONTROL SYSTEMS



Modulating Controls for hot water and radiant heating



Modulating Controls for steam heating



Reset Controls for hot water and radiant heating

5895-B

SARCO • SARCOTHERM

635 Madison Avenue, New York 22, N. Y.

IMPROVED 30 MODEL, 1,000 THRU

D-H CENTRAL

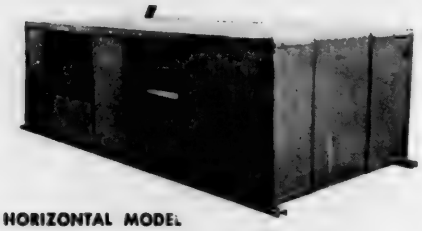
30,000 CFM, H- AND V-SERIES

STATION AIR CON-

ARE MODULAR CONSTRUCTED

DITIONING UNITS

HAVE INSIDE MOTOR MOUNTING



HORIZONTAL MODEL

THE BEST OF PROVED-BEST FEATURES 'N SOME NEW ONES, TOO: SECTIONALIZED CONSTRUCTION. FULL ACCESS TO ALL EXPOSED AREAS. FRAME, STRUCTURAL STEEL ANGLES, WELDED FOR RIGIDITY. FAN SECTION MAY BE FIELD-ROTATED. FANS, FORWARD CURVE, DIDW, CAST IRON CENTER HUB. EXTRA DEEP COIL SECTION CAN ACCOMMODATE 10-ROW COILS. DRAIN CONNECTIONS BOTH ENDS. INSULATED DRAIN PAN INDEPENDENT OF UNIT. SELF-ALIGNING, LIFETIME LUBRICATED BEARINGS. HIGH, LOW VELOCITY FILTERS. SEND FOR TIME-SAVER "FAN PERFORMANCE CURVES"

d-h SINCE 1918

drayer-hanson

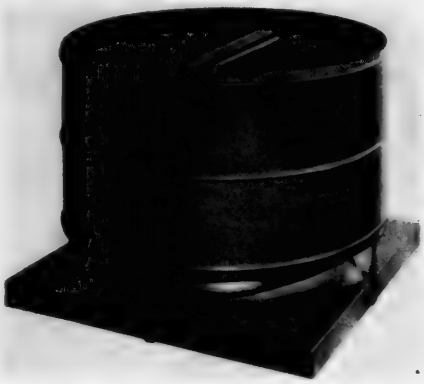
DIVISION NATIONAL U. S. RADIATOR CORP.

3301 MEDFORD STREET
LOS ANGELES 63, CALIFORNIA
CABLE: CLICONI LOS ANGELES

(Continued from page 114)

Sixteen Roof Ventilators Announced

A line of sixteen propeller roof ventilators designated Type UB and featuring high-speed, high-air capacity for up-blast exhaust ventilation in industrial applications, is announced by Ilg Electric Ventilating Co., Chicago, Ill. Capacities range from 3790 to 33,400 cfm.

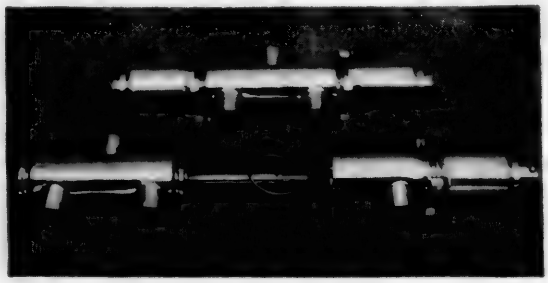


Each unit mounts directly over the roof opening for exhaust from duct or open area. It has a totally enclosed, permanently lubricated, ball-bearing motor; butterfly damper, and steel propeller of airfoil design. Propeller blades can be individually replaced. The sturdily constructed steel housing and weather-tight welded steel frame have aluminum finish over rust-resisting primer.

More information? Circle Item 77, postcard, last page.

Piston Valves

Piston valves are manufactured by Kinwell Corp., Johnstown, Pa. They have machined cylinders made of Schedule 40 pipe in which pistons with standard O-rings move across the ports to make the seal. These valves are both automatic and hand operated, as illustrated.

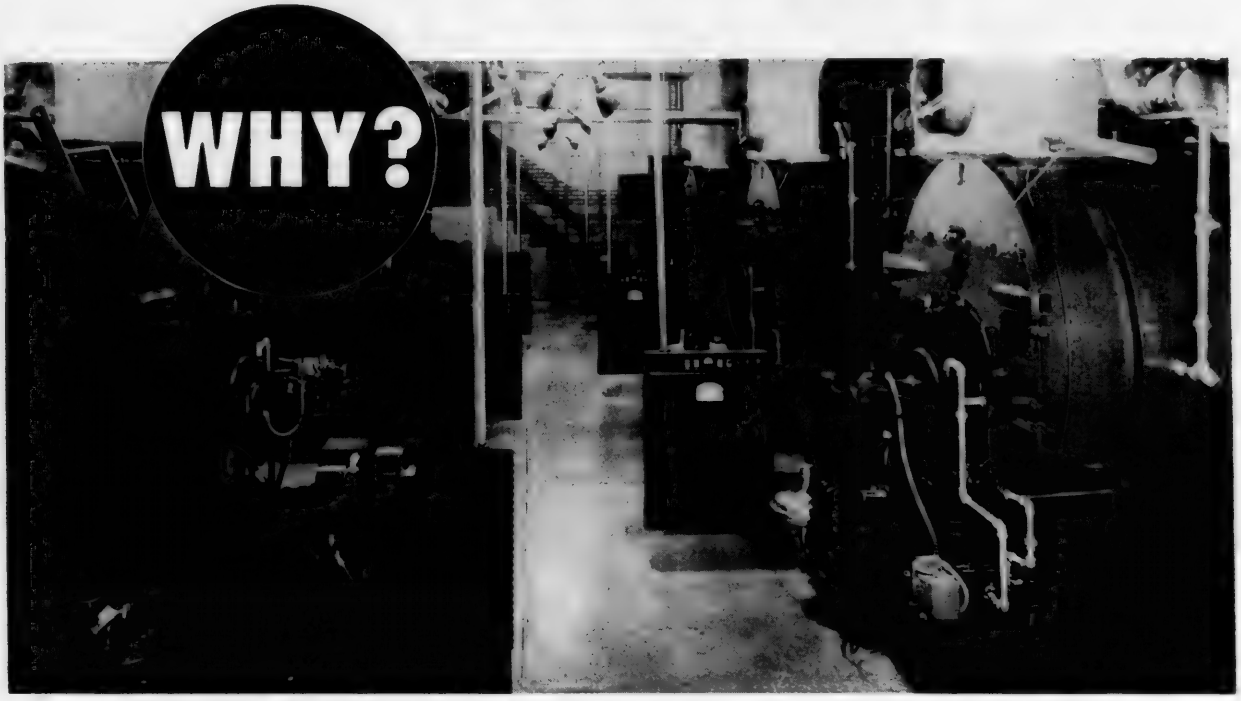


Commercial valves are made of steel, brass, stainless, Hasteloy, and other metals, in sizes from one to 48 inches dia, either straight or angle, with screwed or flanged ends. Double units are also manufactured. When one valve of a double unit is opened, as to a process tank, another port opens for return from the same tank.

More information? Circle Item 78, postcard, last page.

(Continued on page 118)

3 big boilers replaced by 6 small boiler-burner units



Six Petro package units replaced three big boilers in the Masonic Temple, Dayton, Ohio. Consulting Engineer—Schweiger, Heady and Associates, Dayton; Heating Contractor—Reiniger Plumbing & Heating Co., Dayton; Petro Distributor—Southmayd-Rankin Co., Dayton.

Advantages of Petro small package firing

Avoids wasteful use of boiler capacity

Outdoor thermostats put additional boilers "on the line" one at a time —or take them off—according to weather changes. These Petro units not only save fuel, but (quoting Mr. William C. Simpson, Executive Manager of the Masonic Temple Association of Dayton). "We do not have the extremes in building temperatures which were formerly experienced."

Fuel automatically selected by weather

Petro firing units automatically switch from gas to oil when outdoor temperature falls to 20 degrees. This relieves the gas lines of an extra load during periods of peak demand, and a lower gas rate is frequently given by the utility in such cases. Gas firing is automatically resumed as temperature rises. With full automatic control only minimum supervision is necessary.

No stack needed

Petro forced draft firing units eliminate high stacks. In fact, the only flue connection necessary is to a simple vent for the spent products of combustion.

DEPENDABLE Petro firing

Petro engineering stresses simple, non-temperamental design and rugged construction. These qualities, consistent for over half a century, have made Petro famous for thorough dependability.

Mail this coupon for more information

PETRO

T. M. REG. U. S. PAT. OFF.

Makers of quality heating and power equipment since 1903

PETRO
3326 West 106th Street, Cleveland 11, Ohio
(In Canada: 80 Ward Street, Toronto, Ontario)

Please send me literature and specifications on the money-saving Petro Package Unit.

Name .....
Company .....
Address .....
City ..... Zone State

IN MODERNIZATION

GRACIOUS LIVING CALLS FOR

THERMAL

When the Plaza Hotel in Houston planned to modernize its air conditioning system, Thermal multi-zone units were chosen to assure the year-around comfort of the Hotel's transient and permanent guests.

The Thermal line of quality equipment is famous for long life and efficient operation—which means it can be specified with confidence to deliver years of satisfaction. Thermal Engineering equipment includes central plant air conditioners, multi-zone air conditioners, cooling and heating coils, sprayed coil units, heating and ventilating units and air cooled condensers.

Detailed catalog available.

H. E. Bovay, Jr. — Consulting Engineers
Baxter Const. Co. — General Contractors
Massey-Graves Co. — Mech. Contr.
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Agents in principal cities.

Quality Heaters Since 1945

THERMAL ENGINEERING CORPORATION

3603 W. DALLAS • P. O. BOX 13254
HOUSTON 19, TEXAS

(Continued from page 116)

Fountain Unit Fluorinates Water

A drinking water fountain attachment is now available which provides correctly fluorinated drinking water for individual fountains in areas where general water supplies are non-fluorinated.

Designated Haws Model FL-1 Fluoride unit, it is manufactured by Haws Drinking Faucet Co., Berkeley, Calif., and may be installed on any fountain or faucet outlet.

Dual faucet units are also available: one faucet delivers fluorinated water and the other untreated water; either may be taken at the option of the user.

The unit consists of a compact fluoride-source tank and proportioning filter, inconspicuously mounted beneath or behind the fountain on the water supply line. Supply water is partially diverted through the source tank (containing the mineral fluorspar), and when the water "percolates" through this mineral, it is re-admitted to the general supply lines in proper proportions.

Fluoride concentration may be adjusted to the optimums established by public health authorities and the American Dental Association; but even without adjustment, no dangerous concentration of fluoride can result in this system. The unit is designed to provide younger persons in particular with fluorinated water, in areas where cost or political considerations have prohibited the fluorination of general water supplies.

More information? Circle Item 79, postcard, last page.

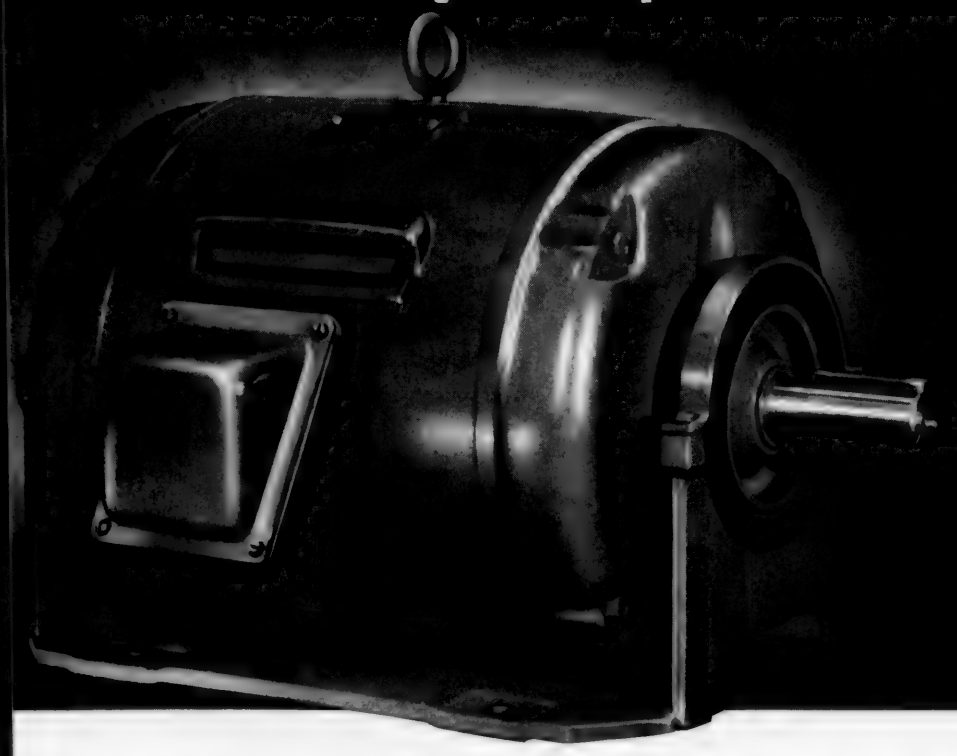
D-C Generators Available

Kato Engineering Co., Mankato, Minn., has extended its line of d-c generators to include 50 different outputs, in sizes ranging from 500 to 40,000 watts. Both shunt- and compound-wound units are available throughout the range of sizes, enabling the generators to be used for a wide range of applications, including battery charging, testing, and operation of d-c appliances. These machines are also used to provide the current for cathodic protection of underground pipes.

More information? Circle Item 80, postcard, last page.

(Continued on page 120)

For *extra quiet* operation...



WAGNER 10 HP RESILIENT MOUNTED MOTORS

are vibration free··sleeve or ball bearing

Today, many motors are installed in areas where noise must be held to a minimum — in hospitals, churches, schools, office buildings, restaurants and similar locations where quiet is essential or desirable.

Such installations have created a need for larger polyphase motors that are exceptionally quiet and vibration-free. Wagner has filled this need by expanding its line of polyphase resilient mounted motors to include standard ratings through 10 hp.

If you have an application that calls for a smooth running motor, cushioned by resilient mountings, it will pay you to specify these Wagner Motors—a complete range of ratings from 1 through 10 hp.

Constant research and development have kept Wagner up front in electric motor design for more than 65 years—made the name Wagner one you can trust in choosing electric motor drives.

Your nearby Wagner Sales Engineer can help you select the *right* motor to meet your requirements. There are Wagner branch offices in 32 principal cities.

Wagner Electric Corporation

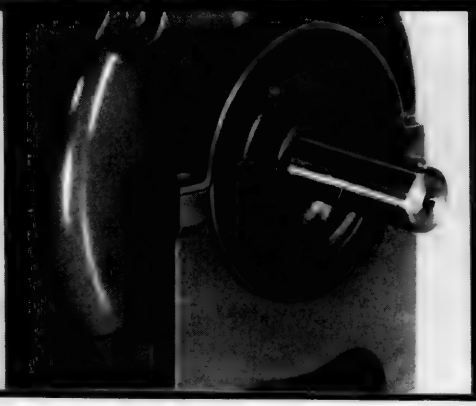
6463 PLYMOUTH AVENUE, ST. LOUIS 14, MISSOURI

WM59-13

SLEEVE OR BALL BEARING. These motors are furnished with quiet running steel-backed babbitt lined sleeve bearings that have high load carrying capacity. Ball bearings can be supplied when desired.

NEOPRENE CUSHIONING RING. Annular mountings, of neoprene bonded to steel rings, cushion the motor in its cradle base to absorb the small amount of vibration that remains in the most carefully balanced motor.

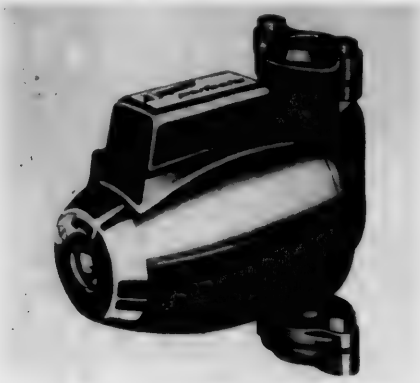
CEILING, SIDEWALL OR HORIZONTAL MOUNTING. You can mount these motors on walls or ceilings by rotating the cradle base 90° or 180°. The motor is designed to remain completely drip-proof in any horizontal position.



(Continued from page 118)

Water Lubricates Pump

A new circulator, called Perfecta, is introduced by Taco Heaters Incorporated, Cranston, R. I. The manufacturer claims it will do the same work with less than half the horsepower of conventional circulators because the power required to overcome friction of seals and loss



of power in a drive coupling has been eleminated.

Unit has no seals or packing, no drive coupling, requires no lubrication, starting switch, or overload protector. It has a one-piece, cast, closed type, impeller. Since it is lubricated by the system water, no oiling or greasing is ever required, the company states.

Pump is available with interchangeable ¾-, 1-, 1¼- and 1½-inch flanges.

More information? Circle Item 81, postcard, last page.

Adjustable-Pattern Air Diffuser

A versatile, compact, adjustable-pattern air diffuser is introduced by Grant Air Products, Verona, N. J. Designed especially to serve the small air conditioning installation, a single diffuser is adaptable for 4-way, 3-way (see illustration), or 2-way air distribution as dictated by the most economical duct layout or other job conditions.

"Natural" appearance and uniform pressure drop for easy balancing is obtained regardless of the air pattern selected. The diffuser is available with or without dampers, and is readily adaptable to positive vapor sealing during winter shutdown without disturbing the damper settings.

Presently available in the popular 8 x 8-inch size, the companion 6 x 6-inch size is contemplated for the near future.

More information? Circle Item 82, postcard, last page.

(Continued on page 124)

YOUR IDEAS WORK BETTER WHEN YOU WORK WITH HONEYWELL

THE FOLLOWING pages bring you some of the latest developments in automatic controls from Honeywell. They widen your choice of products, give you more to work with.

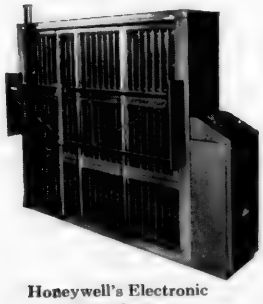
For complete information on these new control products and systems, call your nearest Honeywell sales office. Honeywell provides 112 sales offices throughout the country. Each is staffed with control specialists to assist you in writing specifications and preparing control layouts.

NOW! FLUTTER-JET WASHING
Another first for Honeywell's
ELECTRONIC AIR CLEANER

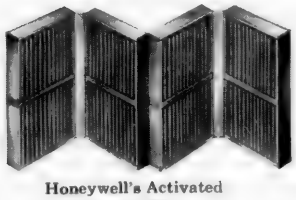
Actual unretouched strobelight photograph taken at 1/2,000 second.

Never before such a quick, efficient way to wash electronic air cleaners! Honeywell's new flutter jet washer literally *blasts* water throughout the air cleaner, with a fluttering, sweeping action that flushes away accumulated dirt quickly—cleans every part thoroughly. The new flutter jet nozzle never clogs.

Honeywell's Electronic Air cleaner
Removes 95% of all airborne dirt



Honeywell's Electronic Air Cleaner



Honeywell's Activated Charcoal Filter

You can now select from three types of cells: (1) *Hi Velocity*—for 99-100% dirt removal or where space is limited. (2) *Standard*—for normal conditions, provides high efficiency dirt removal and high dirt capacity. (3) *Hi Load* for handling high dirt concentration.

With these 3 different cell capacities, you can have complete freedom in designing your plenums. Just select the cell type and number of cells that will give you the air cleaning capacity you need in the plenum space available. No longer is it necessary to design your plenum to fit the air cleaner.

Remove Odors, Too

For the ultimate in air cleaning, team up Honeywell's Electronic Air Cleaner with the Activated Charcoal Filter—for removal of *all odors and gases*, too. Only Honeywell offers this *exclusive* combination.

For more information about Honeywell air cleaning, call your nearest Honeywell office. Or write: Minneapolis-Honeywell, Department HV-5-68, Minneapolis 8, Minn.

Honeywell

H HONEYWELL First in Control

Now! Quality Honeywell Electronic

For multi-zone air conditioning—

THE HONEYWELL CONTROL MASTER*

The Honeywell Control Master brings the advantages of central air conditioning control to small, multi-zone buildings. Three-module construction makes it easy to custom design units to fit the specific requirements of your clients.

Lower module contains combination temperature check button and adjustment knob for each zone. When check button for any zone is pushed, its temperature is indicated on the big, easy-to-read dial. Temperature is corrected by turning the adjustment knob.

Center module is selector switch module, custom built according to the needs of the system. May contain a main power switch, heating-cooling switch, day-night switch, pilot light for filter replacement indication, fan switch, pressure gauge . . . whatever is needed or wanted for your application.

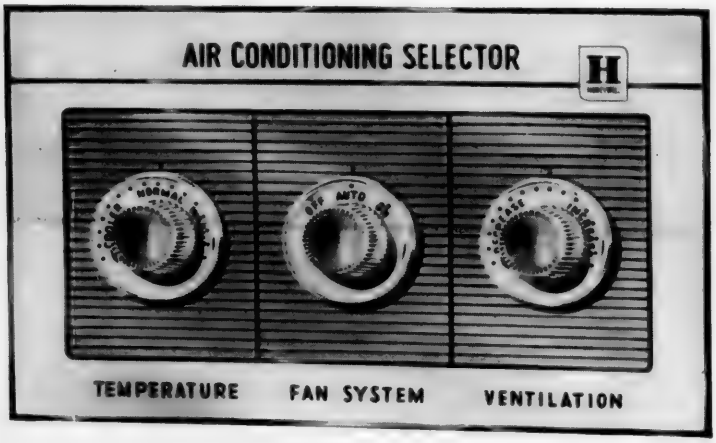
*Trademark

Top module gives system plan and step-by-step instructions, so that whoever is put in charge can quickly learn the operation.

Honeywell Control Masters are available for any multiple-zone application up to seven.

For single-zone air conditioning—

THE HONEYWELL AIR CONDITIONING SELECTO



Designed expressly for single-zone air conditioning systems, the Honeywell Air Conditioning Selector provides temperature, ventilation and fan control in one convenient location. Operating in conjunction with a standard Honeywell electronic control system, it maintains the precise conditions selected.

The attractive selector plate is made of anodized aluminum. It's easy to keep clean, never corrodes. Fits four standard electrical switch boxes, easy to install and maintain.

Controls for Smaller Buildings

For the thermostat on the wall—a complete line of Honeywell Electronic Rounds

Honeywell now offers a complete line of electronic thermostats with world famous *round styling*. Each of the following is available with a new rugged, stainless steel cover:

- With a thermometer and with temperature setting adjustment at the thermostat.
- With thermometer and with remote temperature setting.
- With thermometer, remote temperature setting, plus element for remote temperature reading.

Every model is fast, accurate, dependable, and is available with a tamper-proof guard.

Electronic motors for any heating-cooling need

All motors in this new Honeywell line have built-in electronic relays and are designed for operation of valves, dampers, unit-ventilators and step controllers. They feature summer-winter compensation, with spring closing available as protection against current interruption.

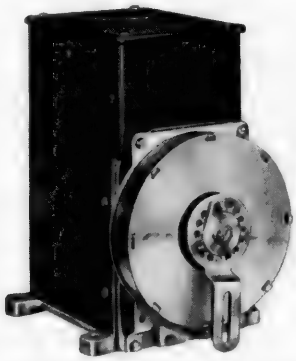
COMPACT. These motors provide in one small package, a powerful capacitator type motor with oil-immersed gear train, integral sensitive relay amplifier and principal bridge components.

FLEXIBLE. For use with any combination of space thermostat, discharge thermostat or return-air thermostat.

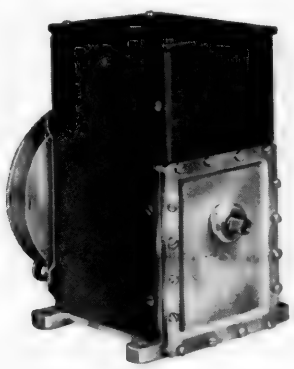
RAPID RESPONSE. Changes at any thermostat are sensed immediately, interpreted by amplifier for fast, corrective action.

SIMPLE ADJUSTMENT. Authority, capacity balance, throttling range and calibration adjustments are made simply and accurately at the motor.

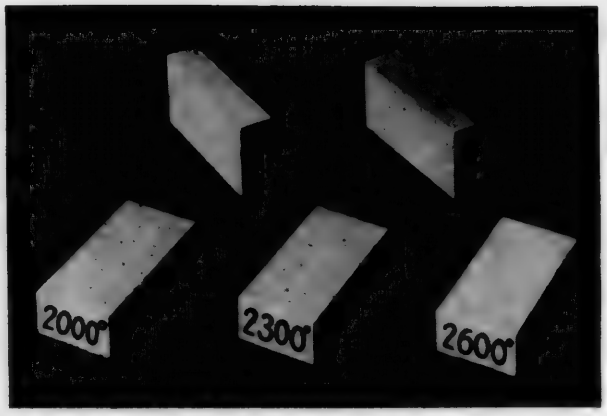
Electronic Motor for Damper, Unit Ventilator, Step Controller.



Electronic Motor for Damper application, spring return.



Electronic Motor for Valve applications, spring return.



GEM

INSULATING
FIRE BRICK
. . . is made to do THE job!

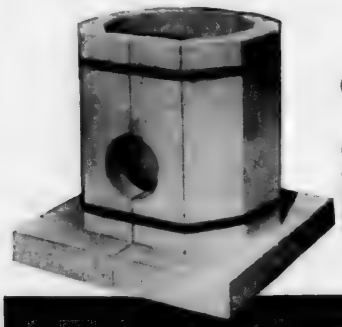
GEM CLAY FORMING has perfected its INSULATING FIRE BRICK bodies to withstand temperatures as shown in the above illustration.

Tests made by MELLON INSTITUTE, Pittsburgh 13, Pennsylvania, show excellent thermal properties in all phases.

Write today for the MELLON INSTITUTE Test results and get the facts on GEM's high quality standards before considering your next purchase.

GEMCO BOND

Gemco bonding material is a high quality refractory bonding cement developed to insure maximum strength.

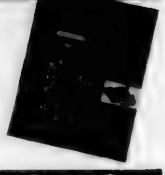


COMBUSTION CHAMBERS

GEM Combustion Chambers are engineered to your specific needs for high or low-pressure burners. Send us your prints for quotation.

SEND FOR THIS BOOKLET NOW...

This illustrated booklet shows the range of GEM CLAY's high quality refractory items and shapes . . .



GEM

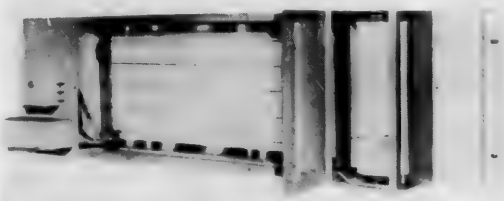
GEM CLAY FORMING, INC.

BOX 500 • SEBRING, OHIO

(Continued from page 120)

Horizontal Automatic Air Filter

American Air Filter Co., Inc., Louisville, Ky., announces the Type H Roll-O-Matic automatic renewable-media air filter. The horizontal design is suited for application on new or existing multi-zone air conditioning units, heating and ventilating units, industrial



heaters, or other types of air conditioning units. Unit also answers the need for horizontally designed filters in ventilating systems where limited headroom is a factor.

Operation is completely automatic. The new unit requires an absolute minimum of maintenance, and filter resistance is constant, according to the manufacturer.

More information? Circle Item 83, postcard, last page.

Easily-Cut Duct Connector

Griploc is a new flexible duct connector announced by Duro-Dyne Corp., Farmingdale, N. Y., said to greatly reduce shop fabrication time and to improve the overall appearance of the completed connector.

This method of fastening fabric to metal consists of a continuous series of fingers which grip the fabric by means of a double lock. Several advantages over previous flexible connectors are offered: The lock dispenses from the carton absolutely flat; it is easier than ever to cut with ordinary snips; and it forms on the brake without tearing the fabric.

The product is available in three models: Junior, Econ-O-Fab, and Metal-Fab. Information and samples are available.

More information? Circle Item 84, postcard, last page.

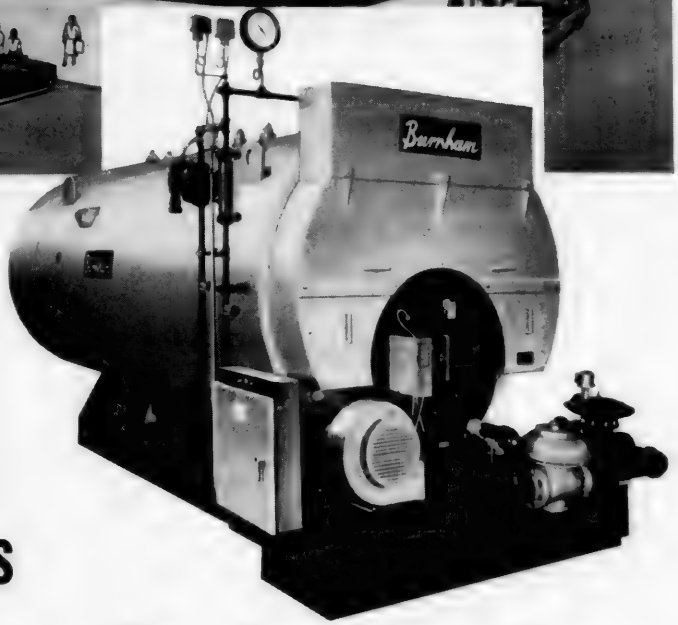
(Continued on page 126)

THE BIG ONES COME TO BURNHAM

MAY'S DEPARTMENT STORE . . . JAMAICA, N. Y.

Leo V. Berger . . . . . *Architect,* . . . . . Brooklyn, N. Y.
Rutherford L. Stinard . . . . *Consulting Engineer,* . New York, N. Y.
Adams Engineering Co., Inc. *Heating Contractors,* . New York, N. Y.

OUTSTANDING NEW DEPARTMENT STORE HEATS WITH *BURNHAM* PACKAGED SCOTCH-TYPE STEEL BOILERS



This newest branch of the May's Department Stores, filling an entire square block, will be heated with two Burnham Packaged Scotch-Type Steel Boilers of the model illustrated. Each is equipped with a gas burner having a certified rating of 261 boiler horsepower. This combustion unit was perfectly matched to the boiler after exhaustive comparative testing by Burnham.

The ideal combination of boiler and burner is an important feature you get with all Burnham Steel Boiler Packages, whether for heavy oil, light oil, gas or oil/gas combination. Burnham Scotch-Type Packages are supplied in capacities from 2,930 to 39,370 sq. ft. net E.D.R. steam and from 703,000 Btuh to 9,450,000 Btuh. New net S.B.I. ratings: Standard Scotch-Type have up to 2,500 sq. ft. of heating surface. In addition, we can supply Scotch-Type steel boilers with up to 4,000 sq. ft. of heating surface when specified.

For full information, mail the coupon today.

Stock boilers in both "Scotch-Type" and the space-saving "Compact-Type" are available for prompt shipment.

Burnham Corporation

Burnham RADIANT HEATING SINCE 1873

Steel Boiler Department
Irvington, New York

Sales Representatives throughout the U.S.A.

SBI MEMBER

Burnham Corporation ACH-59
Steel Boiler Department
Irvington, New York

Please send me, without obligation, full ratings and data on:

Scotch-Type Boilers ☐ Boiler-Burner Packages ☐ Compact Boilers ☐

Name . . . . . .

Address . . . . . .

City . . . . . State . . . . . .

As SIMPLE and
Dependable
as the Pull of a
MAGNET!
A sleeve, raised and lowered within a non-magnetic tube, attracts or releases an Alnico magnet attached to a mercury switch. Basically, this is Magnetrol.
MAGNETROL
The Simplest, Most Versatile
LIQUID LEVEL CONTROL
Ever Devised!

Linked to liquid level by infallible magnetic force, Magnetrol is free from the limitations inherent in mechanical or electrical controls. With the actuating magnet rated at 98% of initial strength after 30 years, Magnetrol has *infinite operating life*, with practically no maintenance at all. There are no wearing parts to get out of order.

What's more, Magnetrol's simple operating principle permits easy, economical modification of standard units to meet *any* pressure, temperature or corrosion requirements. That's why there's practically no limit to Magnetrol's use. It's also why "specials" are likely to be standard with us. Magnetrol units control level changes from .0025-in. to 150-ft. —with single or multi-stage switching.

MAGNETROL, Inc.

● SEND COUPON FOR DETAILS

MAGNETROL, Inc., 2106 S. Marshall Blvd., Chicago 23, Illinois

Please send me catalog data and full information on Magnetrol Liquid Level Controls.

Name_____

Company_____

Address_____

City_____ Zone_____ State_____

(Continued from page 124)

Plastic-Lined Fittings

A line of Plastisol (PVC) lined pipe fittings in malleable iron or aluminum is announced by Victaulic Company of America, Elizabeth, N. J. They are supplied with grooved ends for quick-jointing pipe with the company's mechanical couplings.

Available are elbows, tees reducing tees, caps and adapter nipples from 1¼ through 12-inch diameters, all designed for full flow radii.

The Plastisol lining is essentially a plastic rubber applied by dipping. While specially designed for use with Plastisol-lined pipe, the fittings may also be used with standard weight pipe with uncoated interiors or with linings of rubber, plastic or cement. They are equally suited for use with lined or unlined light-weight steel or aluminum pipe and tubing.

Fittings are suited for handling slurries and abrasive solids in suspension at pressures up to 1,000 psi. They are also resistant to numerous acids, alkalies, salts, plating solutions and organic and miscellaneous reagents. The Plastisol lined system is a rigid system, as compared with certain flexible plastic piping systems, which reduces the number of hangers required.

More information? Circle Item 85, postcard, last page.

Low-Priced Btu Meter

Announced by American Meter Co., Garland, Tex., is a low-priced mechanical Btu meter which accounts for refrigeration or heating furnished by central air conditioning systems using chilled or hot water. Model 200 Btu meter multiplies temperature change of the water by the flow, and two counters register the heat transferred and the water flow. Indication of differential temperature is provided.

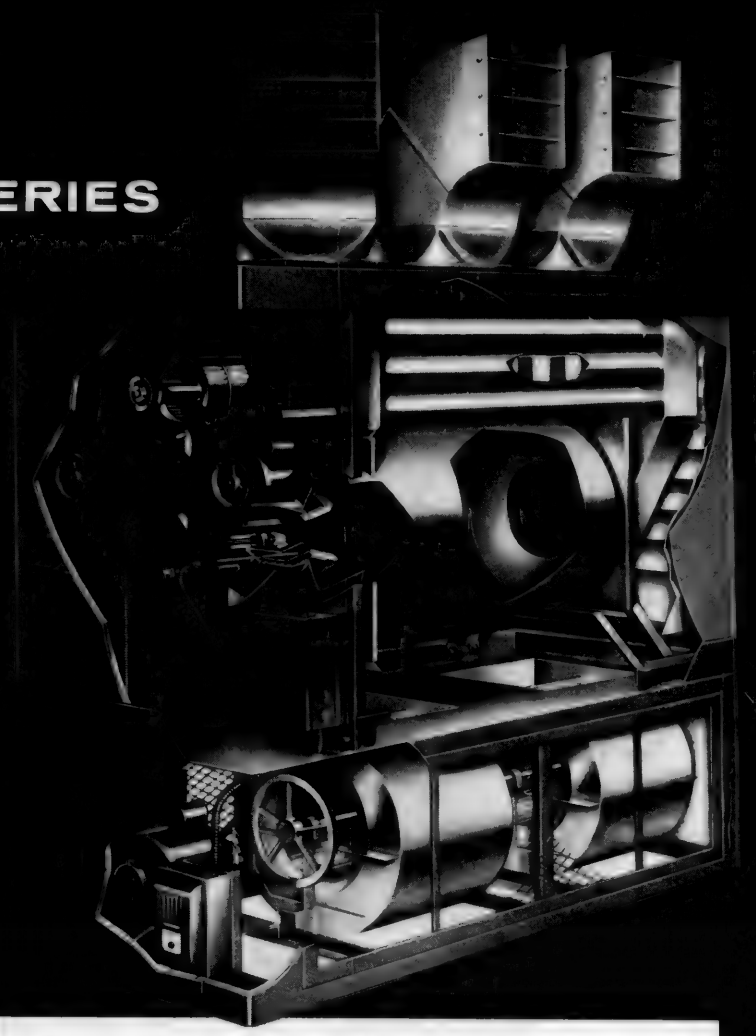
The meter may be located up to ten feet away from the flow measuring element, in a position convenient for reading and checking. Any water volume above 0.25 gpm can be metered.

More information? Circle Item 86, postcard, last page.

(Continued on page 128)

LENNOX "OG" SERIES

COMBINATION BURNER HAS "PUSH BUTTON" CHANGEOVER



Operates equally well with either gas or oil

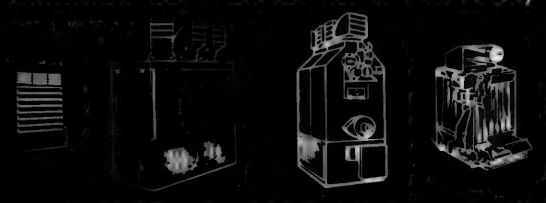
Here is a completely new type oil power burner obtainable as a straight gas burner, a straight oil burner, or a combination burner for either gas or oil. For the combination burner, gas and oil are introduced at two separate points in the same firing assembly. To change from one fuel to the other, you simply throw a switch and it is unnecessary to make any further adjustments.

The outstanding performance and common sense construction of these burners is typical of the "OG" Series heater. For the complete story clip and mail the attached coupon today.

Typical Sequence of Combination Burner Operation

1. Thermostat calls for heat.
2. Combustion air and induced draft blower starts and runs for 25 seconds providing a pre-purge period.
3. Pilot is spark ignited and must be proven within five seconds by lead sulfide scanner.
4. When pilot is proven, the main gas or oil valve opens.
5. There is now a 10-second trial for ignition period which is also monitored by the scanner. Pilot flame is then extinguished.
6. If ignition fails, main burner shuts down immediately.
7. Main flame is continuously monitored.
8. When the thermostat is satisfied, main valve shuts off. Combustion and induced draft blower continues to run for 30 seconds providing a post-purge period.

LENNOX "Task-Matched" Equipment to condition and control air for industry



64,000 to 2,000,000 Btuh Units

LENNOX Industries Inc.

Established 1895

Des Moines, Iowa • Marshalltown, Iowa • Columbus, Ohio
Syracuse, N. Y. • Fort Worth, Texas • Salt Lake City, Utah
Decatur, Ga. • Los Angeles, Calif. • Toronto • Calgary

LENNOX INDUSTRIES INC.
Industrial Division, Dept. AC-5
Box 1294, Des Moines 5, Iowa

Please send me—without obligation—complete specifications and engineering data on Lennox Industrial heaters.

Name .....

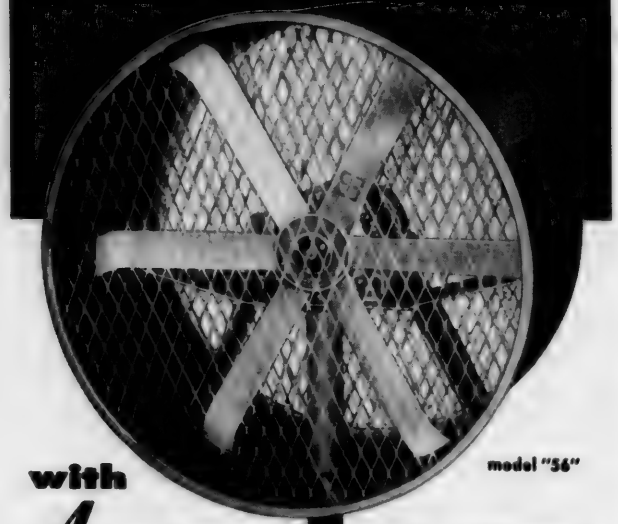
Company .....

Address ..... *City* .....

Title .....

Blow away . . .

HEAT FATIGUE



model "56"

with Aerovent MANCOOLERS

model "6"

model "39"

"stooler"

According to medical authorities, workers in hot, oppressive plant areas are subject to "heat fatigue," which causes involuntary work slow-downs, mental depression, and, in some cases, actual illness. This means lowered production, loss of workdays, and costly employe "turnover."

Aerovent "Mancooler" Fans in strategic locations increase worker efficiency and comfort. This obviously results in greater production . . . a very profitable return from a reasonable investment!

Available with 2, 4 or 6 blades, in diameters from 24" to 48", and capacities to 40,000 CFM, there's an Aerovent "Mancooler" for every industrial application: cooling, ventilating, product drying and processing, or exhausting of heat or fumes.

Write for free Bulletin 250

Heavy-gauge welded steel construction, with steel front and rear guards for maximum safety. (Rubber-tired wheels for Model 39 at slight extra cost.)

Aerovent

Rated in accordance with Standard Test Code and U.S.D.C. Comm. Std. CS178-51.

Aerovent FAN CO. INC.

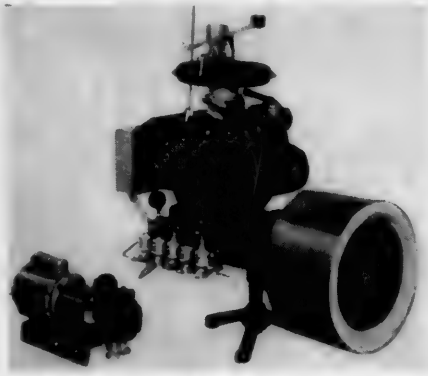
Axle and Brandt Sts. Piqua, Ohio

(Continued from page 126)

Burner for Scotch Marine Boilers

Development of Turbo-Flame, a burner for Scotch marine boilers where there is a known or possible back pressure or positive furnace pressure, is announced by The Mettler Co., Inc., Rockford, Ill., a division of Eclipse Fuel Engineering Company.

Five standard models range from one to 5 million Btu. Burner capacity is actually determined by back pressure developed in the furnace, the company explains. For example, Model TF-1 will burn one million Btu against a back pressure of 5 inches of water, but has a maximum capacity of 1.8 million Btu with a negative pressure, or draft, of 0.1 inches of water.



According to the manufacturer, such problems as pulsation and high-combustion chamber loading are virtually eliminated; correct carbon dioxide levels and stack temperatures below those previously attainable are maintained.

Straight gas, straight oil, or gas-oil combination burners are available in all five basic models. Gas dual-fuel burners are also available.

More information? Circle Item 87, postcard, last page.

Compact Induced-Draft Towers

A line of packaged induced-draft cooling towers for use with commercial or industrial air conditioning systems, as well as in plants where process water is required, is announced by Mason Products, Inc., Woburn, Mass. Designated Series 3200 Hydra-Glide, the line is developed especially to provide more cooling capacity in less space. Model 3208, for instance, which has a 7.5-ton capacity at 78 deg F wet bulb is just 30 inches wide, 45 inches long, and 54 inches high.

The towers, which range in capacity from 5 to 60 tons, are available in all-steel construction with a plastic base coating or stainless steel. All have heart-grade redwood filling, stainless steel fan shaft, and Venturi-type fan throat. Assembly with slip-fit type joints makes possible disassembly of the towers at the installation site for movement through extremely cramped spaces.

More information? Circle Item 88, postcard, last page.

(Continued on page 130)

WEKSLER INSTRUMENTS

on Five out of Five

For the finest, nothing but the finest design, engineering, construction and equipment.

What's aboard the TRITON, the nation's fifth nuclear powered submarine in the way of instruments to indicate and record temperature, pressure and humidity?

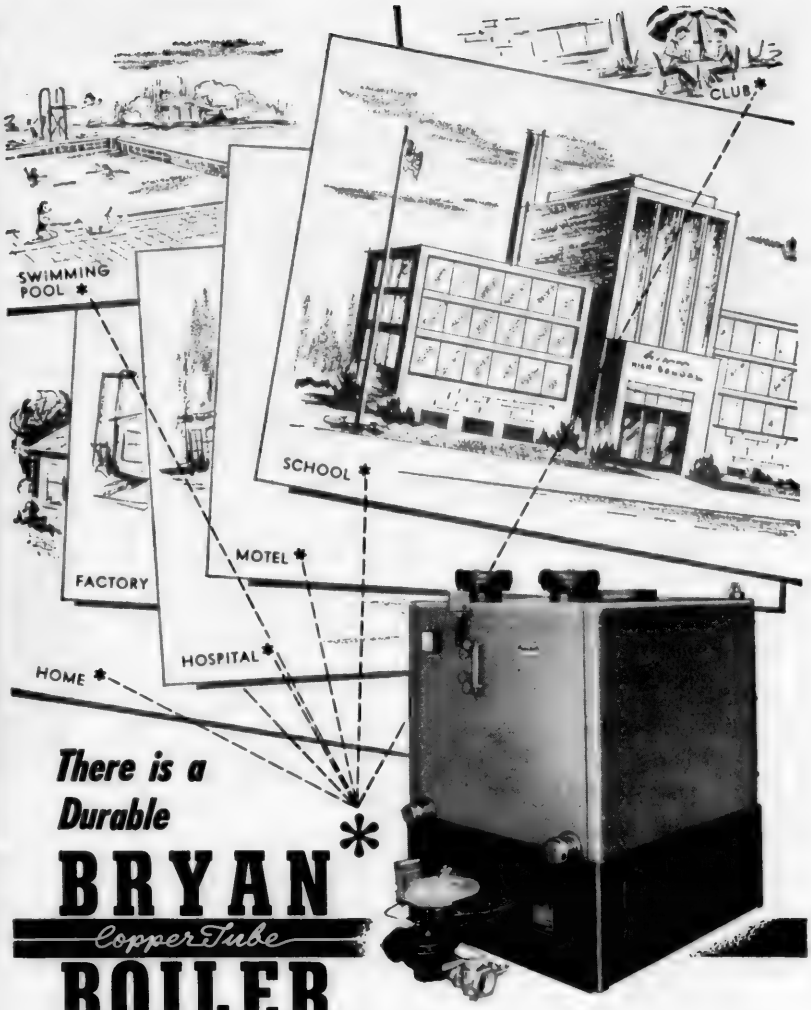
Weksler...just as it's Weksler on the Nautilus, Seawolf, Skate and Skipjack. We're proud of the distinction and of our contribution to the nation's defense, and just as proud of our instruments for earning for us this honor.

Write today for condensed bulletin of Weksler instruments.

Photograph Courtesy of Electric Boat Company Div. General Dynamics Corp.

WEKSLER INSTRUMENTS

WEKSLER INSTRUMENTS CORP.
FREEPORT, L. I., NEW YORK
INDICATING AND RECORDING INSTRUMENTS FOR TEMPERATURE, PRESSURE AND HUMIDITY



There is a Durable

BRYAN* *Copper Tube* BOILER

For every steam or water heating application up to 1,800,000 B.T.U. output.

Whether the plans on your boards are for a factory, apartment house, swimming pool or a modest radiant heat home, a detailed check on specifications will point to one of the many Bryan models covering low or high pressure steam, hot water boilers, or indirect water heaters.

The Bryan is a heavy duty, durable boiler made to deliver a lot of B.T.U's in a short period of time. Specially engineered for gas or oil heating, its high efficiency is complemented by years of trouble free service. Requires minimum floor space.

Bryan is the originator of the famous Bryan copper tubes. They are used in both direct and indirect heating units for fast action and elimination of scale deposits.

Bryan Gas Fired Boilers are designed and built to the requirements of the A.S.M.E. code and are also approved by the American Gas Association (A.G.A.)

Send For Technical Information • 2100 Chili Pike

BRYAN STEAM CORPORATION • Peru, Indiana

here's why the THERMOSTAT in Sterlco® TRAPS does more for you...

ALL TRAPS are NOT ALIKE

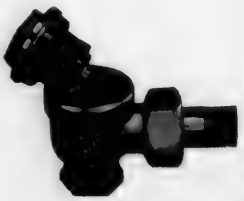
1. If the thermostat is damaged, the *spring action closes the trap*. Trouble is immediately located because radiation becomes cold — no waste of steam — no searching. Thermostats and seats easily replaced.

2. It compensates for pressure changes — operates satisfactorily even if pressures vary.

3. It cannot be damaged by excessive steam pressures or by freezing.

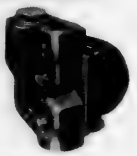
STERLCO THERMOSTATIC RADIATOR TRAPS

Keep radiators clear of condensate without wasting steam. Sturdy bronze bodies and covers—replaceable seats. Angle, Straightway, Corner or Vertical styles.

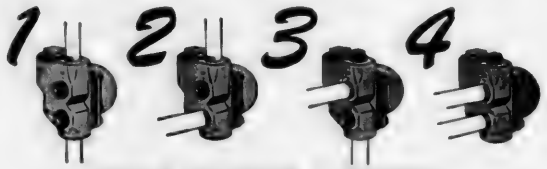


STERLCO FLOAT and THERMOSTATIC TRAPS

Ideal for installation and rehabilitation of unit heaters. Dependable, compact, large capacity, easy servicing and rugged construction makes Sterlco F & T's outstanding performers on unit heaters and other steam heating equipment.



Install the ¾" 69B in the most convenient way



STEAM HEATING is MODERN, EFFICIENT and DEPENDABLE.

Sterlco Products Distributed through LEADING HEATING and PLUMBING WHOLESALERS

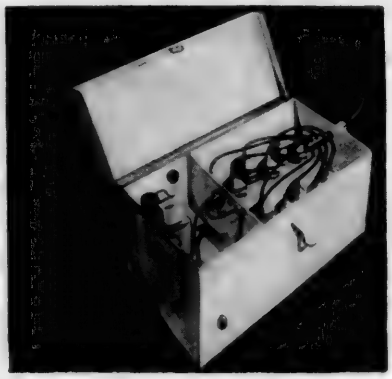
STERLING, INC.

5206 W Clinton Ave . Milwaukee 18, Wis

(Continued from page 128)

Collects Twelve Dust Samples

A process sequential sampler, designed to cut the work required in taking dust samples from smoke stacks and process vents, is available from Gelman Instrument Co., Chelsea, Mich. Twelve dust samples are automatically collected in sequence on 2-inch filter disks. The program of sample collection is easily set by the operator. Air may be sampled at a rate of 2 to 4 cfm, depending on the accessory vacuum pump used.



Sampler is used in air pollution, health physics, industrial hygiene-safety, and process efficiency studies. The usefulness of the sampling unit is extended in communities which require that regular samples be taken of process effluents. Unit is available optionally with a heated chamber surrounding the filter-holders. This prevents moisture condensation when sampling saturated streams.

Filter used with the process sampler may be glass fiber, cellulose, porous plastic membrane, or asbestos, depending on the sampling problem.

More information? Circle Item 89, postcard, last page.

Steel Check Valves

A line of steel-bodied silent check valves is announced by Combination Pump Valve Co., Philadelphia, Pa. These spring-actuated valves close automatically and silently as soon as fluid flow ceases. The stainless steel valve disc is center guided above and below, thus assuring a balanced lift, which greatly reduces wear and permits rapid, positive seating, the company states.

Said to be easily installed in any position, valves provide a large flow area, in excess of pipe diameter, which reduces fluid velocity across the seat face and minimizes head loss. The stainless steel spring closes the valve at the instant forward flow stops, eliminating reverse flow with accompanying shock or slam.

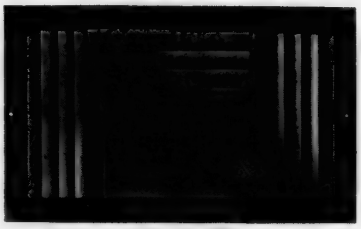
Valves are available in two types in sizes from 2-12 inches dia for pressure ratings of from 150-2500 psi, and are said to be satisfactory for all temperature ranges, including high temperature water heating systems.

More information? Circle Item 90, postcard, last page.

(Continued on page 132)

NEW FROM A-J!

A-J 200 AIF



A-J 200 CF

A-J 200 BF

No. 200 SERIES CEILING DIFFUSERS

with 18 different deflection patterns!

Have a special air distribution problem? Solve it quickly, easily, economically with an A-J No. 200 Series Ceiling Diffuser.

Extruded aluminum curved blades provide maximum air control with minimum resistance. Face bars are 1¼" wide on ¾" centers. You can have your choice of multiple valves (No. 230) or opposed blade dampers (No. 240). Available in either sturdy steel or extruded aluminum frames. Platinum enamel is standard finish.

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A-J

A-J Manufacturing Co.

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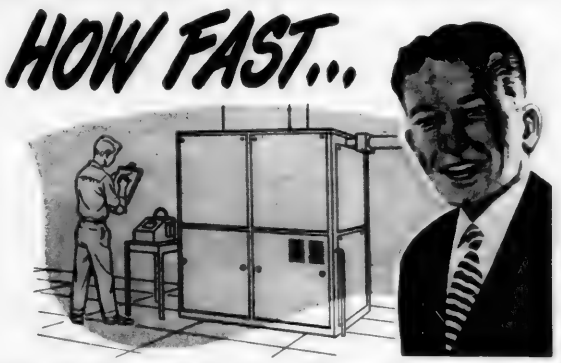
"John Crane" *Plastic Lead Seal is the most economical all-purpose sealing compound for pipe joints, studs and gaskets—*because you use less to get a better seal.* PLS seals for the life of the connection, yet never hardens, allowing joints to be easily broken after years of service.

PLS prevents galling . . . is insoluble in water, gas, steam, many chemicals, refrigerants and petroleum products. Use it for all services . . . low or high pressure applications up to 6000 psi. . . . temperatures to 500°F. Carries the Underwriters' seal of approval.

Prove to yourself that it takes less PLS to give a perfect seal. Send for a generous free sample. Crane Packing Company, 6431 Oakton St., Morton Grove, Ill. (Chicago Suburb) *In Canada: Crane Packing Co. Ltd., Hamilton, Ont.*

John Crane CRANE PACKING COMPANY



Can You Check Your Furnace?

"FAST AND ACCURATE CO_2 READINGS IN 20 SEC."

Continuous readings during adjustments is the *only* way to find the setting for maximum efficiency. With Thermco's portable gas analyzer you can see these changes. Save Fuel Dollars on large and small furnaces.

THERMCO
PORTABLE FLUE GAS ANALYZER

Send Today: For information on all types of Thermco's portable flue gas analyzers. No obligation.

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SMITH®
HYDRO-trol
HYDROSTATIC SHOCK CONTROL

CONTROLS
HYDROSTATIC
SHOCK

CONTROLS PRESSURE WITH PRESSURE

STOPS
PIPING
KNOCK

Hydro-Trol's Pressurized Design using Pneumatic and Hydraulic Pressure to control Hydrostatic Pressure . . . provides a more effective and efficient way to control Hydrostatic Shock and eliminate water hammer in any hot or cold water piping system.

PRESSURIZED DESIGN

NITROGEN PRESSURIZED COMPRESSION CHAMBER
Controls bellows expansion under normal water line pressure so that full expansion capacity is available to control shock

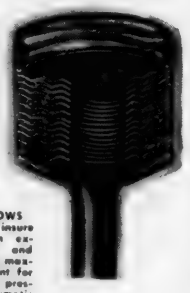
HYDRAULIC FLUID

STAINLESS STEEL BELLOWS

IN LINE DESIGN
Direct Action Type Bellows respond instantly to control shock pressures.

PNEUMATIC PRESSURE
As shock occurs, bellows expand creating a pneumatic pressure cushion which absorbs and controls shock

HYDRAULIC PRESSURE
Controls bellows alignment and cushions bellows contraction to control shock wave bounce.



BALANCED BELLOWS
Constructed to insure each convolution expanding evenly and equally providing maximum displacement for dissipating shock pressures into pneumatic cushion

Built to withstand and control the extreme pressures of Hydrostatic Shock, the bellows are pneumatically and hydraulically controlled and cushioned against metal to metal contact, shock, stress, or strain . . . ever causing metal fatigue and bellows failure.

Using no rubber or synthetic compressables, Hydro-Trol's all stainless steel internal construction is unaffected by temperatures and time. Factory sealed, and permanently pressurized, Hydro-Trol more efficiently and effectively controls Hydrostatic Shock and may be counted upon to last the "Life of the Piping System."

SIX SIZES
Meets the requirements of every hot or cold water distribution system.

COMPACT IN SIZE
Installs in small pipe chase spaces.

LIGHTER IN WEIGHT
Requires no supporting devices.

SIMPLIFIED SIZING
Hydro-Trol makes sizing simple and easy.

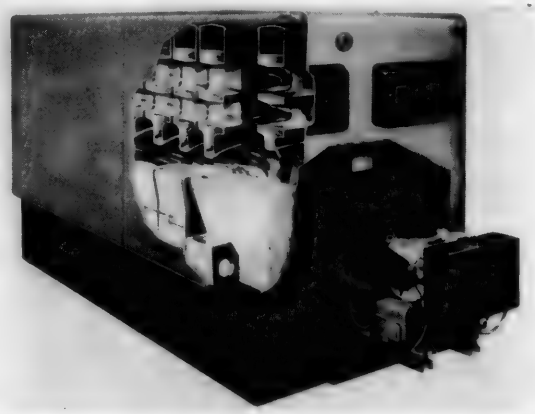
JAY R. SMITH MFG. CO.
Union, New Jersey
PLUMB-EASY

FOR FURTHER INFORMATION WRITE FOR YOUR COPY OF "SHOCK CONTOL BY HYDRO-TROL"

(Continued from page 130)

Burns No. 5, Combination Fuel

Announcement of cast iron boiler-burner units that use either No. 5 oil or combination gas and light oil in a capacity range of 3,395 to 12,260 sq ft of steam is made by Weil-McLain Co., Michigan City, Ind. They are the first such units, the company states.



Units are furnished with air atomizing pressure type burners, completely integrated with the most up-to-date electronic controls and factory engineered combustion chamber design.

The oil heating units, while primarily designed to burn low-cost No. 5 oil, will efficiently handle all grades of lighter oils, it is said. The combination gas-light oil units can burn either gas or No. 2 fuel oil.

More information? Circle Item 91, postcard, last page.

Self-Seating Faucet

A faucet announced by Kel-Win Mfg. Co., Richmond, Va., is based on a new principle. Unlike spring-loaded faucets that snap shut when released, this one remains open at any desired water flow, leaving both hands free. But, the final closing is automatic.

According to the manufacturer, the faucet has been used and tested in government installations since 1955, but the company is now setting up a nation-wide distribution for it. Operation is by a cam and a straight-lift piston action. The person using the faucet starts the closing operation by hand but, before a half turn is accomplished manually, two things happen. The vertical piston and stem is in free position, and a spring takes over to close or seat the valve; and, at the same time, water pressure pushing up against the bottom of the valve in the direction of closing applies pressure, helping to seat the valve and insure a positive and permanent seal.

Because manual pressure is never applied on washers or seat, all maintenance caused by manual squeezing is eliminated, the company states. Also, laboratory tests indicate a 24% savings in hot water usage.

More information? Circle Item 92, postcard, last page.

(Concluded on page 134)

ONE doesn't fit ALL needs!

Get *Airsan* Filters
ENGINEERED TO FIT THE JOB — RIGHT EVERY TIME

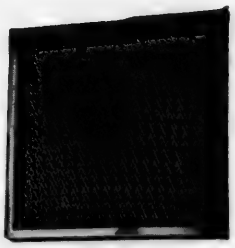
No filter does all jobs, meets every need. That's why Airsan Filters are engineered to the job to offer more effective dust collection. Airsan's expanded metal face plate acts as a lint arrestor to provide easier cleaning and servicing. It distributes air easily over the entire filter area. Provide high filtering efficiency and dust holding capacity with less resistance. Features include all galvanized construction and welded lock corners. Write for data.

Send for Free Bulletins

AFI MEMBER AIR FILTER INSTITUTE

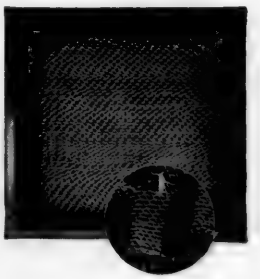
AIR FILTERS
(Low Velocity)

Viscous type, permanent and cleanable designed for industrial, commercial and domestic use. Available in 1" and 2" thickness.



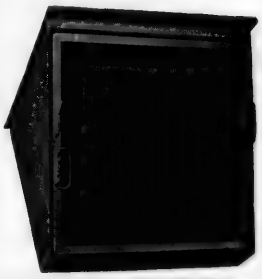
VIRO-CRIMP
(High Velocity)

Has a specially designed high velocity Viro-Crimp filter core. Hemmed edges provide a safety feature. Operates efficiently at 300 to 500 fpm. Available in 2" and 4" thickness.



GREASE FILTERS

Permanent, cleanable type Airsan Grease Filters made especially for range canopies, galleys, kitchens. Available in 2" thickness.



Air Filter Corporation

4554 S. West Woolworth Ave. • Milwaukee, Wis.

Canadian Representative

DOUGLAS ENGINEERING CO., LTD., TORONTO

A Few Distributorships Available. Write for Details!

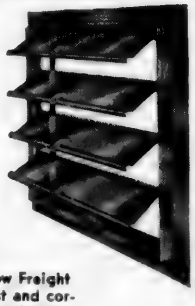
Arno DUCTAPE

Fastest — Easiest Way to Seal Ducts and Apply Insulation

- Sticks instantly to anything.
- Seals airtight — holds fast.
- Vapor-proof, vermin-proof.
- Also, fire-resistant types.
- *Write for free test sample.*

ARNO ADHESIVE TAPES, INC.
4106 Ohio St., Michigan City, Ind.
Dr. Scholl's Industrial Tape Division

Elgo Ventilating Specialties



NEW! EXTRUDED ALUMINUM SHUTTERS

Shutters of modern design which give you ALL of these features: Lightweight, Full Weather Strip, Low Freight Cost, Easier installation, Concealed Pivot Pins, Rust and corrosion Proof and Natural aluminum finish with fluted frames.

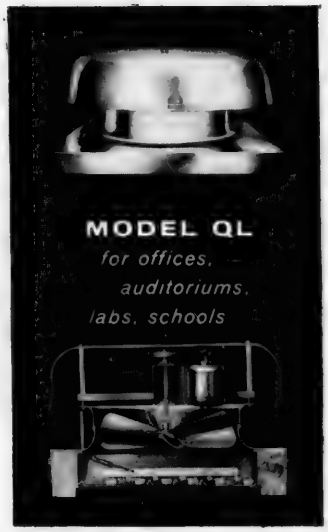
Write for complete specifications.

Free Catalog

ELGO SHUTTER & MANUFACTURING CO.
2732 W. Warren Detroit 8, Michigan

COOK PROPELLER VENTILATOR MOVES UP TO 18,570 CFM...

QUIETLY!



Costs Less Than Centrifugal Flow Unit.. All-Aluminum

Deep-pitched aluminum blades deliver high air volume—from 2,960 to 18,570 cfm—at slow, quiet speeds. Belt-drive, with adjustable pulleys. One-piece top cap and one-piece venturi-type curb base are both spun aluminum. Integral wiring conduit.

Also complete line of centrifugal and axial ventilators available. Write for catalog.

LOREN COOK COMPANY
Berea, Ohio

FOR LOW COST HEATING PLANT POWER-DRAFT AND INDUSTRIAL EXHAUSTING

Patent No. 2,722,372. Other Patents Pending.

...Specify

Quickdraft

★ NO MOTORS, FANS OR BEARINGS IN EXHAUST LINE ★ NEEDS NO STACKS ★ ACID RESISTING FINISHES ★ STATIC PRESSURE UP TO 60 INCHES

FOR HEATING PLANTS AND INCINERATORS, Quickdraft provides constant draft for efficient and economical combustion. It eliminates pulsating or chattering, puffing, smoking and sooting. Costly, tall and unsightly stacks are unnecessary.

FOR INDUSTRY, Quickdraft now offers from ¼-inch to 60-inches static pressure for exhausting corrosive gases, abrasives and paint spray . . . moving fine bulk materials and wastes.

FOR MOVING AIR . . . in or out of building through ducts . . . Quickdraft is outstanding.

N-648-QD

IMPORTANT NOTICE

For withstanding corrosive gases, all Quickdraft units are available in standard acid resisting vitreous enamel, No. 316 Stainless Steel, rigid plastics (P.V.C.) and with plastic and Fiberglas coatings.

Write for QUICKDRAFT ENGINEERING DATA on your application . . . today.

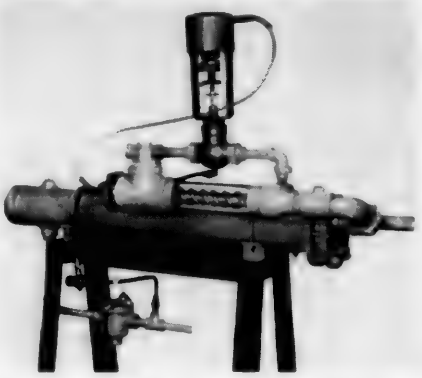
Quickdraft P. O. Box 87-O
CORPORATION Canton 1, Ohio

(Concluded from page 132)

Steam-Fluid Heater Package

A compact steam-fluid heater package, called Instantrol, with a heat-anticipating feature said to provide exceptionally accurate control of steam heated water at widely varying loads is announced by Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Knoxville, Tenn.

The temperature controlled water heating system incorporates a thermostatic regulator bulb in the heated fluid discharge line, providing the heat-anticipating action.



This, together with use of a balanced single seated valve, prevents excessive temperature buildup in the heater on long, no-load, standby periods, the company states.

Advantages of space saving and low cost, the manufacturer claims, are combined with simplicity of the self-powered regulator to provide an accurately controlled hot water supply for a variety of industrial needs, including shower and wash rooms, dish washing equipment, and industrial process requirements.

Package consists of an ASME Code (150 pound unfired pressure vessel) heater, regulator with bulb, steam strainer, mechanical steam trap, discharge thermometer, and other fittings. The unit is fully assembled and tested, ready for connecting steam, water supply, heated water discharge and condensate return lines. Capacity ranges from 2 gpm, with 5 pound steam pressure to 55 gpm with 20 pound steam. Water temperature can be accurately controlled at settings from 110 to 170 deg F. Other temperature ranges can be provided on order.

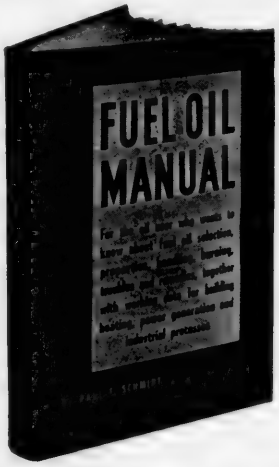
More information? Circle Item 93, postcard, last page.

Mixing Valve for Home Baths

Simix is a thermostatic mixing valve which will be shown this month at the Swiss Government Pavilion of the U. S. World Trade Fair at the New York Coliseum. Made to be installed in the home, it is graduated in degrees to regulate the temperature of the bath, shower, or any faucet water.

Recently invented in Switzerland, the attachment can be installed wherever there are standard hot and cold water outlets, Swiss sources state. It can be installed by a plumber in an hour. The user merely sets the dial at the desired temperature.

Unit is said to work on a bellows principle.



Here is a book that will give you a comprehensive picture of the characteristics and uses of every type and grade of fuel oil. The author explains the meaning of each oily property, and shows how this information is applied to the selection, handling and burning of fuel oil. Impurities and how they effect combustion are described fully, and a special chapter describes fuel oil additives and how they are used. Another chapter lists troubles which may be encountered in using fuel oils, and shows the correct remedy to apply in each case. Technical language is avoided wherever possible and all terms are fully explained.

160 Pages **$4.50** 34 Tables

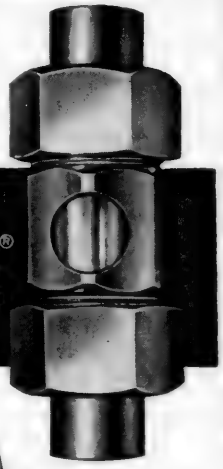
By mail order, Canada or overseas, $5.50

THE INDUSTRIAL PRESS

93 Worth Street New York 13, N. Y.

To order, circle letter K on postcard, last page.

PROVED ON THOUSANDS OF PRODUCTION LINE INSTALLATIONS!



"250" SERIES

LIQUID EYE®

POSITIVE SEALING INDICATORS

designed to save you even more time and money

DESIGN FEATURE

extension-gasket . . . ALL ONE-PIECE!
A built-in gasket that's always in place for positive sealing and foolproof assembly.

6 sizes now available: ⅜", ½", ⅝", ⅞", 1⅛" and 1⅜" O.D.S.

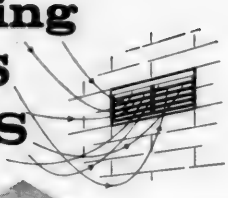
The "250" has all the proved Liquid Eye advantages *plus* these newly engineered features:

- **smaller—more compact, simplified design.**
- **preformed copper extension eliminates need for separate gaskets—*foolproof* installation.**
- **complete, self-contained, economy unit.**

Write today for catalog E-57 covering the complete Allin line.

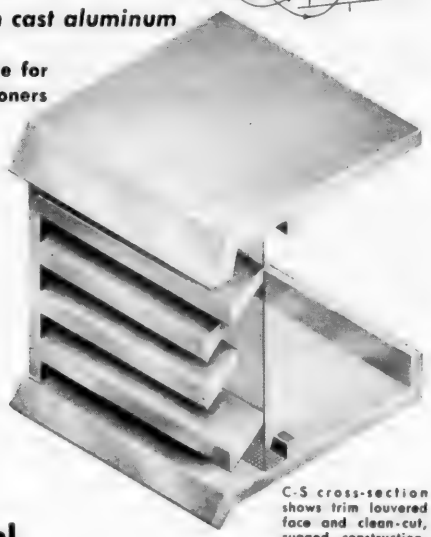
Allin **ALLIN MANUFACTURING CO.**
410 N. Hermitage Ave. • Chicago 22, Illinois
Over 1,000,000 Liquid Eyes Sold to Date!

C-S **ventilating BRICKS and BLOCKS**



in cast aluminum

ideal air intake for unit air conditioners

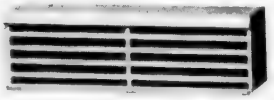


neat
sturdy
economical
high air intake efficiency

C-S cross-section shows trim louvered face and clean-cut, rugged construction, with integral cast water-stop and snugly fit screening.

When you design your next air conditioning or ventilating project—be sure to consider the benefits you can get using C-S vent bricks or blocks. You can be sure they will cost less to buy. What's more, they cost less to install because their dimensions are the same as those of standard or jumbo brick, or block. Twelve modular sizes are available for standard brick construction, two for jumbo brick, and three for cinder or concrete block construction—to go in as the wall goes up.

Another thing: C-S vent bricks and blocks are certified tested, comply with F.H.A. requirements—and give complete customer satisfaction. They cannot rust, corrode, or stain adjacent walls. They are durable—rugged—good looking and are available in a variety of finishes to meet job requirements.



model 4-B—representative of 13 modular brick and block sizes available — is equal to four standard bricks, measures 16½" x 4⅞" x 4" and has a high free area.

representatives in all principal cities
—same day shipment

Write today for 1959 C-S catalog and price and specification data.

C-S **CONSTRUCTION SPECIALTIES, INC.** AV-5-59
55 Winans Avenue Cranford, New Jersey

Please send me the new 1959 C-S brick size vent catalog and complete price and delivery data.

Name_____

Firm_____ Title_____

Address_____

Remote control centers *improved* by new modular electronic components

Modular design permits combinations of *standard* electronic components to meet any temperature and humidity control application . . . easier to install and maintain . . . provides the *best system performance* at the *lowest long-run cost.*

Now through modular design of Barber-Colman remote control center electronic components, system control is improved, flexibility is increased, and appearance improved. Here's how . . .

New Modular Design Electronic Components

Standard, same-sized bridges, amplifiers, sequencers, and compensators installed in standard cabinets in various combinations, provide complete control for any type of system. These modules are easily installed in a remote control center.

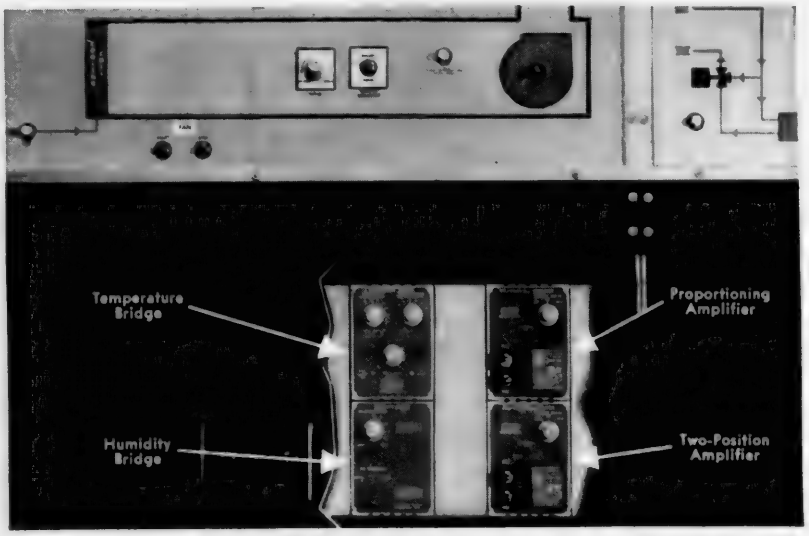
Simplifies System Design and Lowers Initial Cost

By using *standard* components to build up these "controllers," any system can be designed, no matter how large or complex, without resorting to special equipment. Further, because these electronic control components are smaller, a complete remote control center takes up comparatively little room.

Simplifies Installation and Maintenance

All wiring is run to one central point for hookup to the pre-assembled Electrionic Control Center. The only remotely located items are the sensing elements and dependable motor operators. All other circuitry is located at the panel where it is easy to get at. *Bridge modules* contain only fixed resistors and potentiometers requiring little or no maintenance.

Amplifier modules use two lightly driven commercial-type tubes and a plug-in microrelay. An override switch provides for manual operation. Override switches on proportioning amplifiers have a "stop" position which permits stopping motor operator anywhere in its stroke.



Typical electronic zone temperature and humidity controller shown mounted in a remote control center. The controller is built up from standard, same-sized amplifier and bridge modules. In this installation, provision is made for proportional control of a temperature-regulating device (motor-operated valve, damper, etc), and for two-position control of a humidity-regulating device (motor-operated valve, relay, solenoid, etc.).

All modules employ extra-heavy printed circuitry with terminals arranged for short-jumper interconnection.

Electrionic Remote Control

The time-proved basic electronic control system used by Barber-Colman consists of the following: A resistance-type sensing element (remotely mounted), a bridge circuit (cabinet-mounted) to translate any change in current flow from the sensing element into a specific voltage, and an amplifier (cabinet-mounted) to build up this voltage sufficiently to operate a relay (cabinet-mounted), which, in turn, operates the controlled device. Refer to schematic.

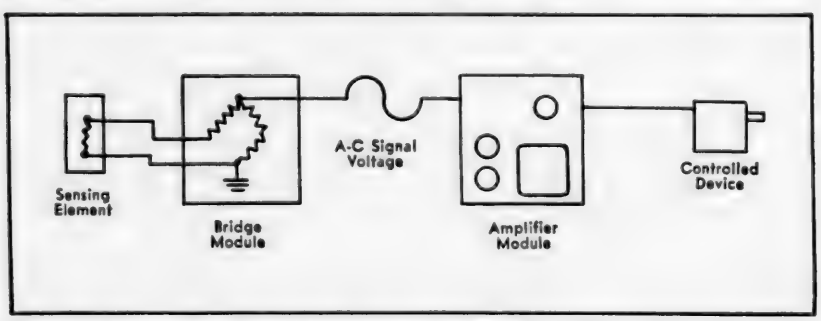
Remote temperature adjustment is standard on bridge modules. It is necessary only to add a remote temperature indication and recording system (new modular bridge) to provide *complete* remote control.

Temperature bridges have provision for three sensing elements making them suitable for systems, amongst others, requiring room, discharge, and outdoor control.

Positive sequencing is provided, using a sequencing bridge or reversing series arrangement. This permits combining heating, ventilating, and cooling in a single year-round system.

Other new compensator bridges provide control system flexibility never before possible with standard components.

For additional information ask for new literature on Modular Electronic Controls. Call your local Barber-Colman field office or write:



Basic control circuit schematic showing single bridge and amplifier modules. The same basic circuit applies to either temperature or humidity control systems. Both temperature and humidity control modules, along with sequencing and compensator modules, may be combined in one controller cabinet. Cabinets are available to hold 2, 4, or 8 modules.

BARBER COLMAN **Automatic Controls**

"Better Control . . .Electrically"

BARBER-COLMAN COMPANY

Dept. Q, 1302 Rock Street, Rockford, Illinois

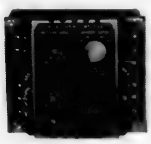
New Modular Design Electronic Components

See opposite page for complete story

Listed below are the electronic "building blocks," which, in various combinations, provide unexcelled remote control for any type of air conditioning system. All modules operate on 115-volt, 60-cycle current, have the same over-all physical dimensions, and can be mounted in standard cabinets of 2, 4, or 8 module capacity. Extra-heavy printed circuitry is used, with terminals arranged for easy short jumper interconnection.

AMPLIFIERS

With plug-in microrelay, two commercial tubes, and convenient manual switch.



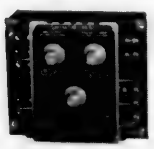
Proportioning Amplifier Shown

Proportional—used with temperature or humidity bridge for proportional control of motor-operated devices.

Two-position — for "on-off" control of motor-operated devices or solenoids in temperature and humidity control systems.

BRIDGES

Consist of electronic bridge circuit, or circuits, made up of fixed and variable (potentiometer) resistors.



Temperature Bridge Shown

Temperature — up to three sensing elements. Allows remote adjustment.

Humidity — provides precise control.

Sequencing — auxiliary circuit. Takes output from temperature or humidity bridge, and converts it to operate several amplifiers in sequence.

COMPENSATORS

Master—made up of fixed and variable resistors arranged for use with above bridges and amplifiers. Provides resetting of several systems from one element.

Master Compensator Shown

Dual — two compensating bridges on one module. Individual adjustments.

Humidity — single bridge provides resetting temperature from humidity or vice versa.

ASK FOR LITERATURE

BARBER COLMAN **Automatic Controls**

"Better Control . . .Electrically"

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Dept. Q, 1302 Rock Street, Rockford, Illinois
Field Offices in Principal Cities

BRIEFLY STATED NEWS ITEMS

WITH THE ENGINEERS

CHAS. T. MAIN, INC., consulting engineers of Boston, Mass., and Charlotte, N. C., announces the election of Franklin P. Parker as director of the corporation. . . .

D. J. Kiely Jr. & Associates will be known as KIELY FLETCHER ASSOCIATES henceforth, with the admission to partnership of Paul W. Fletcher, who for many years has been associated with the mechanical trades. He will be responsible for field supervision of the firm's projects in addition to assuming design and administrative duties. The firm's address is still 276 Washington St., Providence 3, R. I. . . .

BRUCH, MORROW AND KNAFLA, INC., is the new name for the consulting engineering firm formerly known as Nielsen and Bruch. Principals are Wallace C. Bruch, G. Leigh Morrow, and Norman K. Knafla, who recently resigned as chief electrical engineer of the architectural-engineering firm of Magney, Tusler and Setter. Mr. Morrow has been employed for the past eleven years as an electrical engineer specializing in the field of electric power transmission and distribution, street lighting, and lighting protection of electrical systems.

Louis Szerecsen, formerly sales engineer in Minneapolis, Kansas City, and Milwaukee; and Don L. Lewis, formerly O. A. Sutton Company test engineer, have been named headquarters specialists in the sales department of DETROIT CONTROLS DIVISION OF AMERICAN-STANDARD, Detroit, Mich. . . .

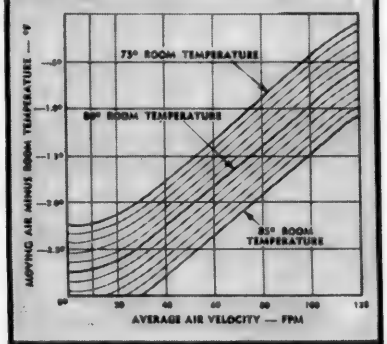
A. J. Mallinckrodt is named chief engineer of DRAYER-HANSON, DIVISION OF NATIONAL-U.S. RADIATOR CORP., Los Angeles, Calif. He heads a staff responsible for design and development and other phases of engineering. . . .

Appointment of three Subject-matter specialists to the executive staff of THE H. K. FERGUSON CO., engineers and builders, Cleveland 14, Ohio, was announced by Ralph W. Olmstead, president. They are:

✻ Comfort Chart Conditions Guaranteed

. . . with Barber-Colman Automatic Controls and Air Distribution components working together in a "combination system"

✻ COMFORT CHART


75° ROOM TEMPERATURE
80° ROOM TEMPERATURE
85° ROOM TEMPERATURE
MOVING AIR MINUS ROOM TEMPERATURE — °F
AVERAGE AIR VELOCITY — FPM

COMFORT STANDARDS

Barber-Colman engineers, through exhaustive tests, have determined a Human Comfort Standard for air conditioning. This research has resulted in the development of the chart shown above, which serves as a criterion for rating performance of air conditioning systems as related to human comfort. The chart indicates conditions of air movement and temperature in an occupancy zone. The line shown for each average room temperature is the limit of satisfactory comfort conditions. All points below the line represent uncomfortable conditions while those above the line fulfill human comfort standards.

Working Together

With a Barber-Colman "combination system," comfort chart conditions are guaranteed because: *correct correlation between air movement and room temperature is established* through accurate, dependable *Electronic* temperature control and *Uni-Flo* engineered air distribution — and because *Barber-Colman assumes the undivided responsibility* for complete system performance.

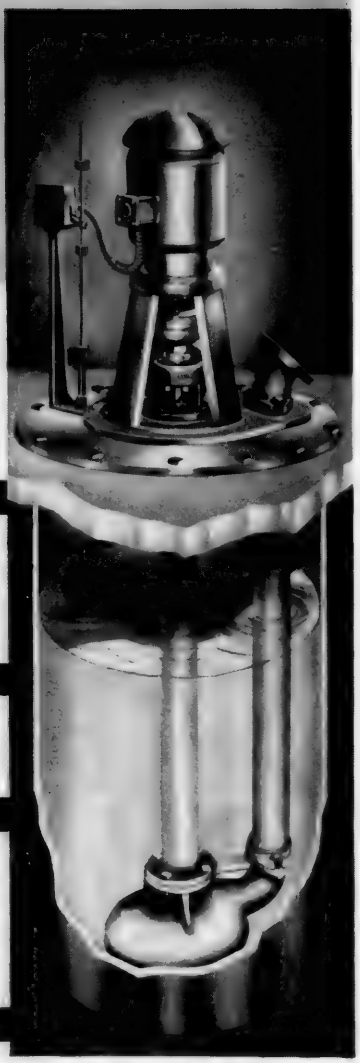
Call your nearby Barber-Colman Automatic Control and Air Distribution office for descriptive literature, or write us:

BARBER COLMAN

BARBER-COLMAN COMPANY

Dept. Q, 1602 Rock Street, Rockford, Illinois

SCREENLESS PUMPS
for
SEWAGE PUMPING
DRAINAGE PUMPING
with a REAL NON-CLOG IMPELLER



This HEAVY DUTY Sewage and Sump Pump with the famous NON-CLOG Impeller, effectively handles large diameter solids, rags and stringy material which are washed into the sewage pit.

RUGGEDLY BUILT

This factory assembled unit has an ample reserve of strength to meet the most severe conditions and to furnish years of trouble-free operation.

SIMPLIFIED INSTALLATION

Only one piping connection required. Only one electrical connection. An ECONOMICAL installation.

CAPACITIES

A large selection of units to meet every need. Capacities to 1500 GPM; heads to 86 feet; can be supplied with 1750 RPM, 1140 RPM or 870 RPM motors; four and five inch discharges.

NON-CLOG IMPELLER

The NON-CLOG Impeller built into this Screenless Sewage Pump supplies the ideal method of pumping sewage of other unscreened liquids containing solids. This design eliminates the necessity for expensive pneumatic ejectors and various other pumps requiring screening devices.

Successfully handles the tough jobs where other pumps fail.

Pumps of this design are still operating satisfactorily after 25 years in service.

Send for Bulletin C-900 or refer to weil catalog in Sweet's 1959 or Domestic Engineering Catalog Directory. Weil Representatives and Weil Engineers are available to help solve your waste pumping problems.

weil PUMP COMPANY

1516 No. Fremont St. Chicago 22, Illinois

William T. Webster, director, Pulp and Paper Div.; Ross A. Langworthy, director, Power Plant Div.; and John M. Chambers, assistant director, Chemical Division. . . .

JOHN J. MAHONEY AND FRANK L. CIOFFI, consulting engineers, have taken a new office at St. Regis Building, 34 Park Place, Newark 2, N. J. Formerly located in New York City, where they were engaged in industrial plant design for several years, they will continue their activities in the mechanical, structural, and chemical phases of engineering and provide construction supervision. . . .

J. HERMAN CO., Los Angeles, Calif. heating and air conditioning contractors, celebrates its 57th anniversary this year. The firm was established by Jacob Herman, who is celebrating his 80th birthday. A past president of the Los Angeles chapter of the Mechanical Contractors National Association, Mr. Herman is a member of the Board of Directors of the Construction Industries Home Show and Sheet Metal Contractors Association.

Walter L. Fleisher, president of AIR AND REFRIGERATION CORP., *New York, N.Y., died April 18 of injuries received earlier in a traffic accident.* A past president of ASHAE, and HPACNCA Standards Committee chairman, *he was one of the first to install air conditioning, and held over one hundred patents.*

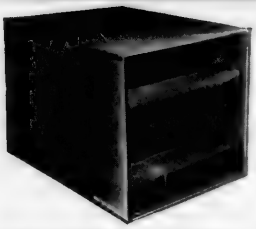
SOCIETIES AND ASSOCIATIONS

The first annual meeting of the AMERICAN SOCIETY OF HEATING REFRIGERATING AND AIR-CONDITIONING ENGINEERS will be held at Lake Placid, New York from June 22 to 24, 1959. As a result of the merger the annual meeting of the Society shifts from January, as it was in ASHAE, to June. With only one meeting instead of the formerly separate meetings of ASRE and ASHAE, the technical sessions planned by the Program Committee will offer something of interest to each phase of the industry. Approximately 25 technical papers are to be presented and there will be conferences (symposiums) on industrial heating and ventilation, domestic refrigerators, cryogenics. . . .

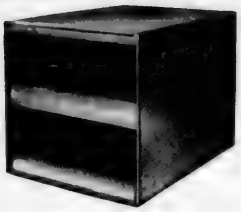
(Continued on page 140)

"Chicago" from

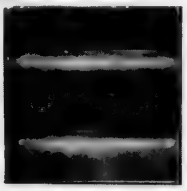
UNI-SILENCER* For AIR CONDITIONING and VENTILATING SYSTEMS



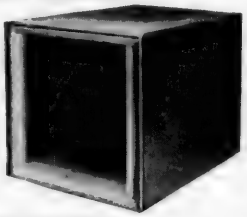
UNI-SILENCER* MODEL A. Moderate pressure drop, standard acoustical efficiency.



UNI-SILENCER* MODEL LPD. Lowest possible pressure drop, moderate acoustical efficiency.



UNI-SILENSER* MODEL B. Higher pressure drop, maximum acoustical efficiency.



UNI-RESONATOR* Low frequency duct silencer—used in series with UNI-SILENCERS*.

T. O. SILENCER Elbow silencer for ducts.

E H ROOF VENTILATOR SILENCER for power roof ventilators.

*Reg. U.S. Pat. Off.

A full line of Elof Hansson silencers to effectively reduce airborne noise generated by fans in air conditioning, ventilating systems and by power roof ventilators. They are easily and conveniently installed in building structures at low cost due to new mass-production methods made possible by standardizing on modular sizes. Savings are of such proportions that UNI-SILENCER* prices compare favorably with conventional duct lining.

The performance of UNI-SILENCERS* both as to acoustical attenuation and pressure loss have been tested and certified by independent, impartial outstanding authority. The certified data is guaranteed in writing and bonded. Free engineering service!

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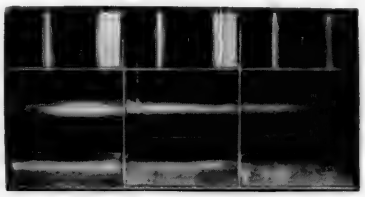
UNI - SILENCERS* are slip - joined as simply as children's building blocks, to fit almost any conditions or requirements.



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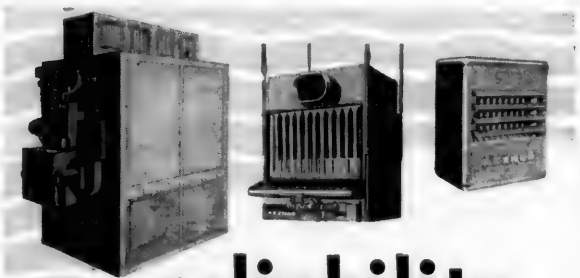

reliability

Reznor heaters are designed and built for long life and reliable service. They've proved their ability to do the job in countless thousands of commercial and industrial installations. Quality always pays off in the long run. When you specify Reznor equipment you can be confident that you're specifying a quality heating system which will give your client years of trouble-free service with minimum maintenance.

RELIABILITY is just one of many reasons why there is no "equivalent" for Reznor . . . the world's largest-selling gas unit heater. Ask your Reznor distributor for the complete story or write for your free copy of "Modern Heating".

Look for Reznor under "Heaters-Unit" in the Yellow Pages

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Stick With

Fastak DUCT INSULATION ADHESIVE

STRONG BOND IMMEDIATELY

AN ADHESIVE FORMULATED ESPECIALLY FOR BONDING INSULATION TO METAL DUCTS THAT IS ECONOMICAL, YET IT CONTAINS ALL THE QUALITIES DESIRED FOR AN IMMEDIATE, STRONG, AND LASTING BOND.

ELIMINATES

- Clips, Screws, Caps, Wires, Staples, Tape, etc.
- Extra man to help hold insulation in place on wrap around jobs.
- Time lost in waiting for insulation to bond before brake forming.
- Filming over of adhesive and not bonding on large areas where certain types of adhesives are used.
- Stocking several types of adhesives for different jobs.
- Mixing.

QUALITIES

- WATERPROOF.
- EXTENDED COVERAGE—
  Brush application—230 sq. ft. per gal.
  Roller application—270 sq. ft. per gal.
- TEMPERATURE RANGE—
  Blanket.....—30° F to 325° F.
  Board.....—30° F. to 250° F.
- LABOR SAVING SMOOTHNESS OF APPLICATION.
- COLOR—Clear with slight orange tint.

DUCTAK

DUCTAK is designed for those who desire a slightly slower setting time than Fastak. Approximately one hour is required before ducts may be brake formed without danger of breaking bond. Other than this, all the features and qualities mentioned above apply to DUCTAK.

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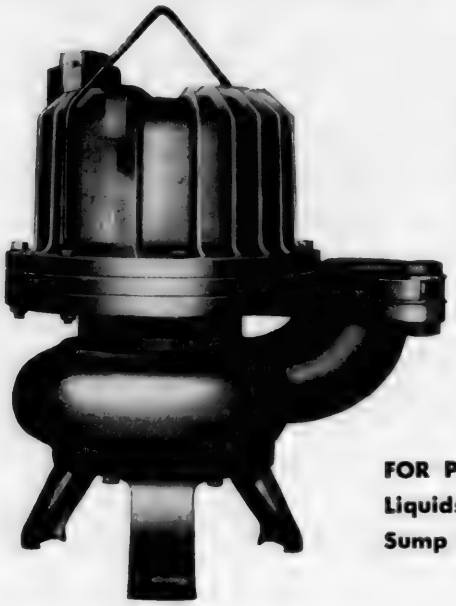
*Trademark



- Low Original Cost
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- Easy To Install
- Easy To Service
- Pump And Motor Operate Completely Submerged

FOR Pumping Sewage And Other Liquids Containing Solids . . . and Sump Pump Applications

The new "Chicago" IMMERSIPUMP* is a development of 50 years of experience in the research, engineering and manufacture of sewage and sump pumps for buildings, industrial plants and municipalities.

The finest materials are used . . . to assure years of trouble-free service. No superstructures are required for outdoor installations . . . minimum head room is required for indoor installations. The Stainless Steel Bail enables easy installation and removal of the unit. The enclosed Non-Clog pump impeller passes solids up to 2½". The pump casing is made of close-grained, cast iron . . . the shaft of Stainless Steel. A separate Suction Plate, with tripod, is furnished to support the entire unit . . . enabling easy, quick access to the Impeller.

The Motor is specially designed for submersible operation . . . being totally-enclosed and oil filled to positively assure against water entering the unit.

. . . *available with the new* SEALTRODE* Sealed Electrode Floatless Pump Controller . . . the *only* Controller featuring completely sealed Electrodes . . . positively preventing insulation or coating by grease or other corrosive elements.

"Chicago" Distributors are located in most principal cities. See the one nearest you today for full details.

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FOOD MACHINERY AND CHEMICAL CORPORATION

Chicago Pump Company

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Members of the newly organized Southern Ohio chapter of the AMERICAN SOCIETY OF SANITARY ENGINEERING were reminded of the special heritage the men in Ohio possess: the work of Bill Groeniger and Henry Blank. In 1927 Mr. Groeniger warned of the dangers to health and to life itself in his research reports on cross connections. Many lives have been saved because of the knowledge he imparted on the design of water systems to prevent contamination. Henry Blank was another who made substantial contributions to health and sanitation through the plumbing engineering profession. . . .

Appointment of Allan Ray Putnam as managing director of the AMERICAN SOCIETY FOR METALS was announced. He will occupy a new position established by the ASM Board of Trustees following the death last May of William H. Eisenman, a founder-member of the Society and its well-known national secretary and executive head for 40 years. Mr. Putnam comes to the Society from Detroit where he is assistant executive secretary, American Society of Tool Engineers.

At its 111th annual meeting, members of the oldest engineering society in the United States, the BOSTON SOCIETY OF CIVIL ENGINEERS, elected Edward C. Keane, vice-president of Fay, Spofford & Thorndike, Inc., and a prominent engineer in the New England area, as president for the coming year. Mr. Keane accepted the position from retiring President, William L. Hyland. . . .

Enlargement of the Show Committee of AIR CONDITIONING AND REFRIGERATION INSTITUTE by appointment of three additional members to meet with the committee to consider a program of conference-type meetings in connection with the 11th Exposition of ARI at Atlantic City in November has been announced. Conferences will be designed to interest architects, consulting engineers, government specifiers, and manufacturers of end products, who are customers for the parts and components to be displayed. The new members are Paul

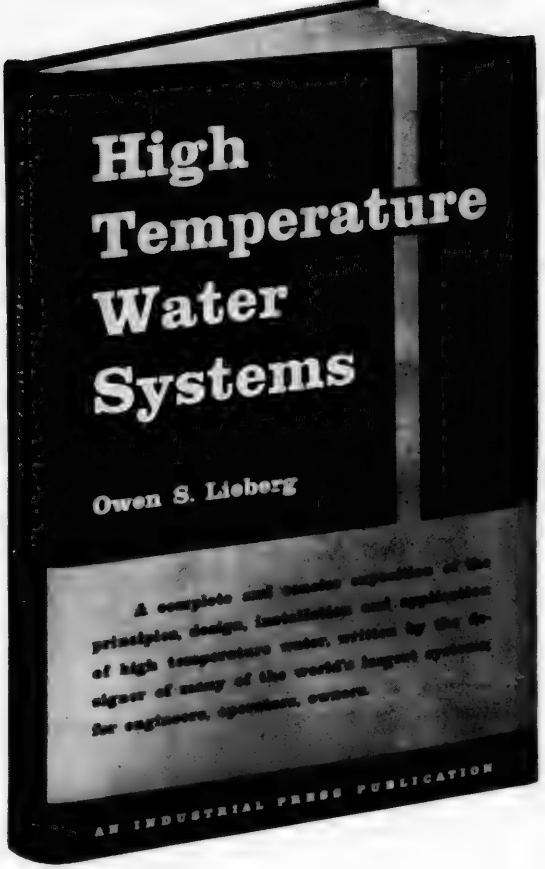
(Continued on page 142)

for FUME

Briefly Stated

Webster

NEW • COMPLETE AUTHORITATIVE



HIGH TEMPERATURE WATER SYSTEMS meets the need for an authoritative explanation of the principles, design and operation of high temperature water (HTW) systems.

The author is a distinguished international authority who served as consultant on the largest HTW system in England (Bicester Ordnance Depot) and such U.S. installations as the Forbes and Olmstead Air Force Bases and the Cross factory in Detroit. He also designed the HTW system for the largest military establishment in Canada.

The book contains original design data used successfully in actual systems. Tables, graphs, photographs and specifications serve as a working guide . . . and let you benefit from Mr. Lieberg's knowledge and experience.

A special feature is a full-chapter treatment of the design of a typical system . . . step by step . . . based on the principles developed in the book. After mastering this procedure, the engineer will have little difficulty in completing the design of *any* HTW system!

CONTENTS

1. **Advantages of High Temperature Water**
   Arguments for HTW. Brief history. Sample calculation comparing HTW to steam.
2. **Thermal Properties of Water**
   Basic thermodynamics. Units defined. Property tables for water and steam.
3. **Some Design Considerations**
   Temperature drop, system pressure, thermal storage, system flexibility, secondary steam.
4. **Pressurizing the System**
   Reviews pressurizing methods: Steam, air, inert gas. Special cases; heat-power systems.
5. **Boilers and Expansion Tanks**
   Boiler selection. Water tube boilers. Summer load conditions. Sizing expansion tanks. Nitrogen pressure tanks.
6. **Controlling the System**
   Combustion control for various fuels. Control panels. Water level and flow control. Btu meters.
7. **System Circulation Pumps**
   Great detail covering the "heart of the system." Guarding against flashing. Pump specs. Friction heads. Parallel pumps. Auxiliaries, drives, piping.
8. **Valves**
   Valve types and selection. Materials. Emergency closing valves. Valve sizing. Venting by air bottles.
9. **Piping**
   Heat flow capacity of pipes. Design temperature drop. Expansion loops and joints. Pipe sizing and insulation.
10. **Process Heating**
    HTW for process heating. Heat exchangers and converters. Valving and control for process.
11. **Space Heating with HTW**
    Unit heaters. Fan-coil systems. Radiant panels. Complete with application data for all systems.
12. **Applications**
    Describes numerous military and civilian installations in U. S., Canada, and Europe. Economic and design comparison with low temperature water and steam systems for similar situations.
13. **Designing a Typical System**
    Ten-step design procedure for any HTW system. Theory and practice summarized and applied to complete design example.
14. **Appendix**
    A complete specification of a typical boiler plant and auxiliaries for a high temperature water system.

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M. Augenstein, president of Airtemp Div., Chrysler Corporation; M. M. Lawler, vice-president, Worthington Corporation, and R. K. Surfass, vice-president, Westinghouse Electric Corporation. . . .

The Technical Committee of the FUEL OIL AND WATER HEATER MANUFACTURERS ASSOCIATION, New York, N. Y., is in the process of writing thermal and mechanical standards covering steam-to-water, water-to-water, and other types of shell and tube heat exchangers. When these are complete they will be available in brochure form to engineers and architects for specifying purposes. The following companies are presently members: Adsco Industries, Inc., Davis Engineering Corp., General Fittings Corp., Manning & Lewis Engineering Co., Patterson-Kelley, Inc., Richmond Engineering Co., Taco Heaters, Inc., The Sims Company, Water Tube Boiler & Tank Co., and Yula Corporation. . . .

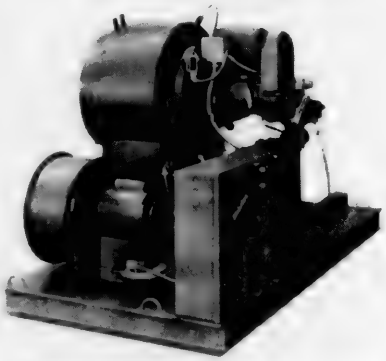
STANFORD RESEARCH INSTITUTE, Menlo Park, Calif., announced two major changes in its corporate title structure: E. Finley Carter, SRI director, is named to the newly-created post of president, and will serve as a member of the executive committee of the board of directors. Weldon B. Gibson, associate director, has been named vice-president and member of the board of directors. These actions have been taken in response to the growing size and scope of the Institute's activities, and in recognition of the stature—both national and international—which it has achieved. The Institute's relationship with Stanford University is not affected. SRI articles of incorporation stipulate that the trustees of the University are the general members of the not-for-profit corporation, and that the president of the University is *ex-officio* chairman of the SRI board of directors. . . .

NEW REPRESENTATIVES

The Joel O. Turner Co., 202 West Taylor Ave., East Point, Ga., is appointed sales representative for CORDLEY & HAYES, manufacturers of electric water dispensers, for Georgia and South Carolina. In addition to the Cordley line, Mr.

Webster

GAS and/or OIL BURNERS



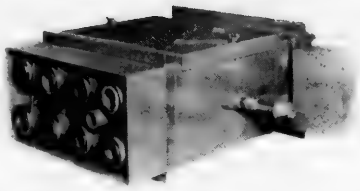
LARGE or SMALL

SINGLE or DUAL FUEL

PACKAGED or FIELD ASSEMBLED

ATMOSPHERIC or FORCED DRAFT

ELECTRONICS of ALL TYPES



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WEBSTER ENGINEERING
Company
Box 5246, Tulsa, Oklahoma

Turner's company also represents other firms in the plumbing field. . . .

Milwaukee Stove and Furnace Supply Co., 5070 West State St., Milwaukee, is the new Wisconsin distributor of BRYANT MANUFACTURING CO.'s residential heating and air conditioning equipment. . . .

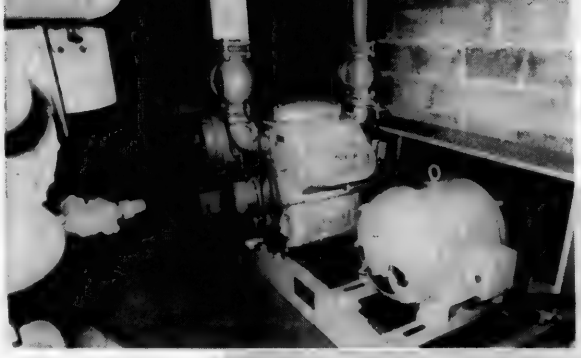
DURO-DYNE CORP., Farmingdale, N. Y., has designated William D. Bogh as sales representative for Southern California and Arizona. Mr. Bogh also represents Field Controls, Skuttle Manufacturing Co., and Bacharach Industrial Instrument Company. . . .

R. J. McCrory, Jr. is representing, in the Pittsburgh area, the L. J. WING MFG. CO., Linden, N. J., manufacturers of combustion and air handling equipment. He will handle sales in Pittsburgh, Western Pennsylvania, and Eastern Ohio counties, Northeastern Maryland and Northeastern West Virginia. The new Pittsburgh office is located at 301 Forest Avenue, Ben Avon, Pittsburgh 2, Pa. . . .

The following distributors of its 4-D wrought iron pipe are announced by A. M. BYERS CO., Pittsburgh, Pa.: Union Supply Co., Durham, N. C. (in cooperation with Byers' division office in Atlanta); Brown Pipe & Supply Co., 2222 First St., N.W., Albuquerque, N. M. (in cooperation with the Houston office); Aetna Engineering Co., Alton, N. H. (in cooperation with the Boston office); and Mid-States Supply Co., Kansas City, Mo. (in cooperation with the St. Louis office). . . .

The BLAKE DIVISION OF HOFFMAN SPECIALTY MFG. CORP., Indianapolis, Ind., announces that Borin & Frankel, 48-15 31st Avenue, Long Island City 3, N. Y., is its representative for the metropolitan area of New York and Northern New Jersey. . . .

Wittichen Supply Company is the new wholesaler in the Birmingham, Ala., area for the complete line of DUNHAM-BUSH products for air conditioning, refrigeration and heating. In business since 1946, Wittichen recently expanded facilities to include a drive-in window for speedier service on phone orders, a "first" in wholesaler merchandising, it is said. . . .



△ View of Vilter compressors that provide the refrigeration for the air conditioning system.

Beautiful Doctors Motel St. Petersburg, Florida.

▽

Comfortably Cool in a Warm Sunny Clime

Comfortably cool year 'round . . . inside, that is, at Doctors Motel, St. Petersburg, Florida. Dependable Vilter air conditioning is the answer.

There are 100 motel units at Doctors Motel and all are Vilter air conditioned. The system has a total capacity of 100 tons and is designed to keep the rooms at 78° F. and 50% relative humidity when outside temperature is 100° F. and humidity 90%.

This motel was opened to the public in December, 1956. From that time to the present *not a single adjustment has been required on the air conditioning system.* It is functioning perfectly and hasn't required any service work . . . a cost-saving installation. The owners are delighted with the performance of the Vilter system.

Vilter equipment installed at Doctors Motel includes two six-cylinder VMC Refrigerant-12 compressors; one shell and tube condenser, liquid receiver, water chiller and 100-ton heat exchanger.

Correct system layout, well-engineered equipment, careful fabrication, and floor testing of Vilter equipment pays off in efficient operation, long life and minimum maintenance. Why not call in Vilter for your refrigeration and air conditioning requirements.

Sold by Vilter Distributor, O'Dower Engineering Company, Kansas City 6, Mo.
Architects: Kivett, Myers & McCallum, Kansas City, Mo.
Mechanical Engineer: W. L. Cassell, Kansas City, Mo.

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The Vilter Manufacturing Company, Dept. G-816
2217 S. First Street
Milwaukee 7, Wisconsin

Bulletin 820
Vilter VMC
Compressors

Vilter®

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THE VILTER MANUFACTURING COMPANY, Milwaukee 7, Wisconsin
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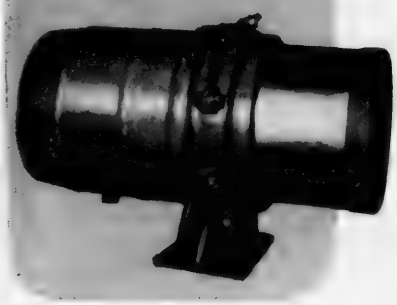
- Costly shutdowns eliminated.
- Maintenance records show 1 manhour per year per joint.
- Fewer expansion joints needed per length of pipeline with Gun-Pakt.

YARWAY GUN-PAKT EXPANSION JOINTS



For new Yarway Expansion Joint Catalog EJ-1916 write YARNALL-WARING Co 104 Mermaid Avenue, Phila. 18, Pa.

go YARWAY with confidence

Briefly Stated

PRODUCTS DIVISION OF TODD SHIPYARDS CORP., New York, N. Y., announces that Universal Combustion & Air Conditioning Corp., 7 Herkimer Place, Brooklyn, is functioning as sole distributor, warehouser and servicing agency for the Todd line of stationary burners and replacement parts within the five boroughs of New York City and in Nassau and Suffolk counties of New York. . . .

Handling packaged residential and commercial equipment for AIRTEMP DIV., CHRYSLER CORP., are two independent wholesalers-distributors: The Sampson Co., Chicago, Ill., and the recently-organized McCarthy & Co., Inc., Milwaukee, Wis. The Sampson Co. has appointed R. M. Hagan manager of its air conditioning division. . . .

Two New York State representatives for AMERICAN AIR FILTER CO., INC., Louisville, Ky., have combined their operations. Paul H. Chartres, Albany, and William L. Jacobs, Schenectady, have merged their firms and are now doing business under the name of Air Equipment Company. Air Equipment Company is the sales outlet in the upstate New York area for AAF's line of air filters, dust control, engine & compressor, school air systems, heating, ventilating, air conditioning, and commercial portable heater products. With the creation of the new firm, Pierce F. Chartres, who had been associated with AAF for thirty-four years, retired from active participation in the business. . . .

Airtrol Supply, Inc., 2701 Agnes St., Corpus Christi, became the fifth separate organization in the State of Texas to currently represent DRAYER-HANSON, Los Angeles, Calif., Div. of National-U.S. Radiator Corp. Airtrol's territory includes the Greater Corpus Christi area, and the Rio Grande Valley, West to Laredo and northwest to Victoria. . . .

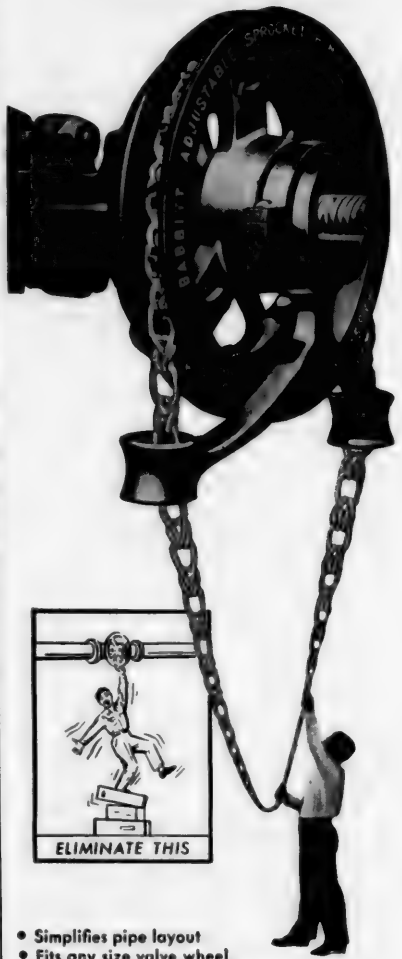
JENN AIR PRODUCTS CO., INC., Indianapolis, Ind., announces the appointments of the following representatives: O. M. Jones Co., 1015 A. E. Unake Ave., Johnson City, covering the eastern part of the state of Tennessee; R. E. Gardner Company, 107-12th Ave. North, Nashville, covering the central part

SAFE OPERATION OF OVERHEAD VALVES

with a

Babbitt

Adjustable
SPROCKET RIM
with Chain Guide



- Simplifies pipe layout
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Babbitt STEAM SPECIALTY CO.

5 BABBITT SQUARE, NEW BEDFORD, MASS., U.S.A.

of Tennessee, and Walter C. Strickland Co., 152 Ellis St. N. E., Atlanta, covering the entire state of Georgia. . . .

New representatives of FARR COMPANY, Los Angeles, Cailf., manufacturer of air filtration equipment, are: F. C. Clifford Inc., 1014 Cathedral St., Baltimore 1, Md.; George A. Schiller, 140 Elmdorf Ave., Rochester 19, N. Y.; Law Instrument Co., P. O. Box 95, Angola, Ind.; McMurry and Co., 33 NE 6th St., Miami, Fla.; Air Filter Sales & Service, 1521 Southwest Ave., Portland 1, Ore.; General Equipment Co., 616 Hyde Bldg., Spokane, Wash., and the following offices of Engineering Sales Co.: 171 Audubon Blvd., New Orleans 18, La.; P. O. Box 9806, Jackson, Miss.; 4824 Woodside Dr., Baton Rouge, La.; and P. O. Box 603, Mobile, Ala. . . .

Dyke and Tutsch Co., Milwaukee, has been named boiler sales representative for CLEAVER-BROOKS COMPANY packaged fire tube boilers for the entire state of Wisconsin with the exception of the Eau Claire and Superior areas. They have represented the Milwaukee manufacturer in southeastern Wisconsin since 1952.

BURGEONING BUSINESS

David E. Morgan, director of research of WARREN WEBSTER & COMPANY, Camden, N. J. manufacturer of heating and cooling equipment announced a three-year plan for research and development, including a critical analysis of Webster products with a view of incorporating design change wherever it is indicated by market and consumer need. The Division is particularly interested in research in the air conditioning field. . . .

CRANE Co., Chicago, Ill., has consolidated its sales and purchasing divisions as part of a continuing program aimed at increasing operational and organizational efficiency. A substantial part of the company's sales presently involves the merchandising of products made by other manufacturers. Since sales and purchasing are so closely related in the company it is advantageous to combine the two functions. The consolidated divisions

EDWARDS
REFRIGERANT CONDENSERS COST LESS, REDUCE MAINTENANCE COSTS.

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- More durable construction
- Longer trouble-free operation
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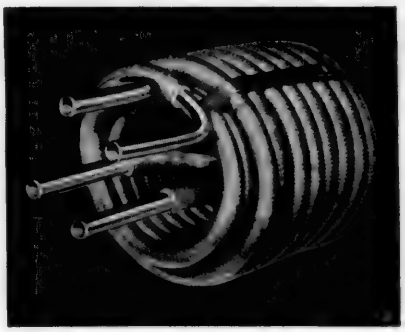

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- Simplified connections

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The convection air-cooled condenser that eliminates fans, motors, noise, and maintenance. **Catalog AV-2**

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140 Feet of Burt Monovent Ventilates Armco Steel Heat Treatment Building

CONTINUOUS RIDGE GRAVITY VENTILATOR OF ARMCO ALUMINIZED STEEL EXHAUSTS HEAT AND FUMES OVER ENTIRE LENGTH

This husky 48" Burt Monovent Continuous Ridge Ventilator is on Armco Steel Corporation's Heat Treatment Building at their Butler, Pa. Wheel Works. Its Armco Aluminized Steel Type 2 exterior provides excellent resistance to atmospheric corrosion, assuring long service life and reduced maintenance. . . . The Monovent is particularly efficient for heavy industry—in steel mills, foundries, forge shops, etc. It converts the entire roof line into a huge exhaust that rapidly removes high heat and fumes from its entire length. Floor operated center-hinge-type dampers control the unit. . . . The Burt Monovent's simple, sturdy construction provides long, trouble-free life. Standard sizes from 4" to 96" handle almost any requirement. See Sweet's for complete data or write Burt—today!

INSTALLS ON ANY TYPE ROOF
SIZES FROM 4" to 96" IN ANY LENGTH
STURDY LONG-LIFE CONSTRUCTION
MINIMUM MAINTENANCE

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It supplies quick data on Burt's complete line of modern Roof Ventilators.

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49 E. South St. Akron 11, Ohio
MEMBER AIR MOVING & CONDITIONING ASSOCIATION, INC.

Briefly Stated

will be headed by George F. Burley, newly elected vice-president for marketing and procurement. He has been vice president for purchasing and traffic since Dec. 1, 1957. . . .

Purchase of the GENERAL BLOWER CO., Morton Grove, Ill., by ILG ELECTRIC VENTILATING CO., was announced. The newly acquired company will be operated as the General Blower division of Ilg Electric Ventilating Co. and will continue to manufacture industrial fans, turbo blowers, heat fans and forced draft equipment. No change in personnel is contemplated. . . .

WALWORTH COMPANY, New York, N. Y., a leading manufacturer of valves and fittings, has completed negotiations with Midwest Piping Company, Inc. for the manufacture of Walworth welding fittings to complement its present lines of cast and malleable fittings. Fittings will be sold nationally through Walworth offices and distributors. . . .

DRAVO CORPORATION, Pittsburgh, Pa., has opened a new sales office in Hartford, Connecticut, at 119 Ann Street to sell and service its complete line of industrial and commercial warm air space heating and process drying equipment. The Hartford office will serve the entire state of Connecticut and Hampden, Hampshire, Franklin and Berkshire counties in the Commonwealth of Massachusetts. . . .

Carrier Corporation, Syracuse, N. Y., and Stone-Platt Industries, Ltd., of Great Britain, jointly announced the formation by Carrier International Ltd. and Stone-Platt of a new company, CARLYLE AIR CONDITIONING AND REFRIGERATION LTD., which will engaged in the air conditioning and refrigeration business. The announcement disclosed that the same interests have acquired all the outstanding capital stock of Winsor Engineering Company Ltd., Glasgow, Scotland, which for many years has specialized in the installation of air conditioning, ventilating and refrigeration systems on shipboard. The head offices of Carlyle will be in London. Ralph S. Reynolds, formerly in charge of the business of Carrier International in the Union of South Africa, has been designated managing director.

Simplifying Field Survey Data
How to make a survey — Sample survey form

Basic Design Data
Design coordination — Design data form

Plumbing Codes
Code variations — Interpretation — Revising a code — National plumbing code

Footing Drains Around Buildings
Installation — Cleanouts — Sand interceptors

Location and Construction of Dry Wells
Sizing — Construction — Location

How to Install Drainage Piping in Fill
Compacted soil — Fill — Piping support

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Rainfall disposal — Dry Wells — Drainage basins

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Sub-surface Water Conditions
Piping arrangement — Waterproofing — Sewage ejectors

Design and Construction of Manholes
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Responsibility — Piping — Installation — Connections

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Wet Columns in Multi-story Buildings
Water and waste facilities — Spacing — Arrangement

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Vent Stack Terminal
Roof penetration — Flashing — Protection

Preventing Sewage Backflow in Buildings
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Basins — Special conditions — Code compliance

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How to Install Exterior Cleanouts
Ground settlement — Grass surfaces — Paved top

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Economy in Service Hot Water Generation
Condensate coolers — Storage — Piping

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Water hammer causes — Methods of control — Devices

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Occupancy — Standard and extra equipment

Fire Protection for Apartment Houses
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Fire Protection in Tall Buildings
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Emergency Protection of Laboratory Personnel
Emergency devices — Showers — Location — Types

Drinking Water Systems
Fountains — Coolers — Roughing in — Central systems

Distilled Water Systems
Distilling units — Storage tanks — Central systems

Fixtures for Mental Hospitals
Rest rooms — Lavatories — Water closets — Roughing in — Shower rooms — Private rooms

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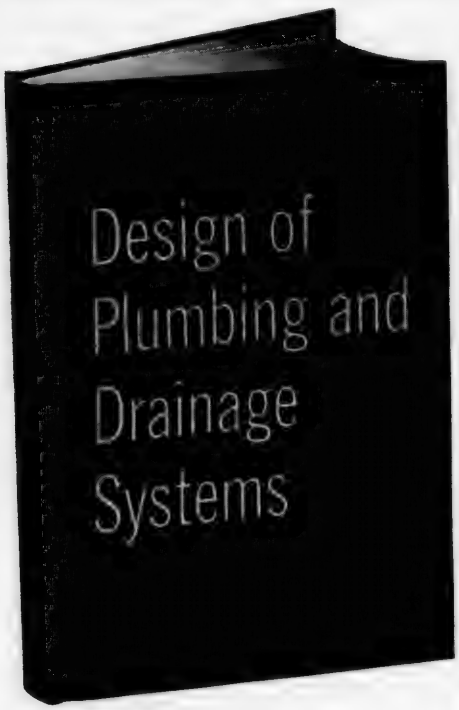
Motel units — Arrangement — Access — Fixtures

Water and Drainage Facilities for Animal Quarters
Cage cleaning — Drainage — Waste systems

Draining the Planting Area
Interior areas — Roof areas — Exterior planting



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1. Finger-tip adjustment projects air stream in any desired location.
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(Book Reviews concluded from page 97)

ciples of refrigeration, there are chapters on air refrigeration systems; vapor refrigeration systems; the compound vapor-compression systems; refrigerant compressors; solid carbon dioxide; multiple evaporator systems, absorption refrigeration system; refrigeration in air conditioning; water vapor refrigerating systems and heat pumps.

Mechanical Refrigeration, by N. R. Sparks and C. C. DiLio. Cloth bound, 6 x 9 inches, 283 pages. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. Price, $8.

• • •

CANADIAN DEGREE-DAYS—The Meteorological Branch, Department of Transport, Dominion of Canada, Ottawa, has published a 15-page mimeographed circular on degree-days by months for 24 localities in southern Ontario and seasonal totals for 131 localities, together with monthly and seasonal extremes and probability data in connection with degree-days. It is identified as Cir. 3159, CLI.—18.

Canadian Degree-Days for March, 1959*

City	March		Cumulative	
	1959	Normal	1959	Normal
Calgary, Alta.	972	1200	7653	7740
Charlottetown, P. E. I.	1218	1220	7380	6900
Crescent Valley, B. C.	953	940	6619	6600
Edmonton, Alta.	950	1290	8405	8660
Fort William, Ont.	1290	1380	8980	8750
Grande Prairie, Alta.	1118	1380	9308	9100
Halifax, N. S.	1053	1042	6248	5997
London, Ont.	1116	1040	6636	6250
Medicine Hat, Alta.	899	1130	7594	7510
Moncton, N. B.	1227	1190	7665	7190
Montreal, P. Q.	1207	1180	7491	7240
North Bay, Ont.	1357	1350	8429	8210
Ottawa, Ont.	1250	1220	7849	7520
Penticton, B. C.	758	780	5545	5520
Prince George, B. C.	966	1110	7764	7760
Quebec City, P. Q.	1370	1300	8477	7960
Regina, Sask.	1085	1420	9125	9190
St. John, N. B.	1192	1160	7439	7040
Saskatoon, Sask.	1090	1440	9278	9390
Timmins, Ont.	1489	1530	9440	9400
Toronto, Ont.	1064	1018	6187	5936
Vancouver, B. C.	675	680	4302	4430
Victoria, B. C.	659	620	4125	4050
Windsor, Ont.	995	950	6112	5710
Winnipeg, Man.	1356	1441	9489	9178

*These data are supplied through the courtesy of the Meteorological Division Air Service Branch, Department of Transport, Canada.
The Department reports slight revisions in the figures for February as published in last month's issue. Corrected figures are Grande Prairie, Alta., 1548; North Bay, Ont., 1953; Ottawa, Ont., 1534; Saint John, N. B., 1397.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available

NDHA CONVENTION—50th annual meeting of the National District Heating Association, Skytop Lodge, Skytop, Pa. Secretary-Treasurer, John F. Collins, Jr., 827 N. Euclid Ave., Pittsburgh 6, Pa. ..... **JUNE 1-4, 1959.**

GAS AIR CONDITIONING SCHOOL—Sales school for gas air conditioning sponsored by the American Gas Association, Baker Hotel, Dallas, Tex. Ralbern H. Murray, American Gas Association, 420 Lexington Ave., New York 17, N. Y. ..... **JUNE 1-5, 1959.**

ASTM MEETING—Annual meeting of the American Society for Testing Materials, at Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. ..... **JUNE 21-26, 1959.**

ASHRAE MEETING—Annual meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, at the Lake Placid Club, Lake Placid, N. Y. Secretary of the Society, 62 Worth St., New York 17, N. Y. ..... **JUNE 22-24, 1959.**

AIR POLLUTION CONTROL MEETING—Annual meeting of the Air Pollution Control Association, at the Hotel Statler, Los Angeles, Calif. H. M. Pier, executive secretary of the Association, 440 Fifth Ave., Pittsburgh 13, Pa. ..... **JUNE 22-26, 1959.**

ASSE MEETING—Annual meeting of The American Society of Sanitary Engineering, at the Mayflower Hotel, Washington, D. C. M. Mercury, treasurer-secretary of the Society, 4328 South Western Ave., Chicago 9, Ill. ..... **JULY 19-24, 1959.**

INDUSTRIAL GAS SCHOOL—Industrial gas school of the American Gas Association, Penn-Sheraton Hotel, Pittsburgh, Pa. Ralbern H. Murray, American Gas Association, 420 Lexington Ave., New York 17, N. Y. ..... **SEPTEMBER 14-18, 1959.**

ISA INSTRUMENT-AUTOMATION EXHIBIT—14th annual Instrument-Automation Conference and Exhibit of the Instrument Society of America, at the International Amphitheatre, Chicago, Ill. H. S. Kindler, ISA, 313 Sixth Ave., Pittsburgh 22, Pa. ..... **SEPTEMBER 21-25, 1959.**

WELDING SOCIETY MEETING—Fall meeting of the American Welding Society, at the Sheraton-Cadillac Hotel, Detroit, Mich. A. L. Phillips, American Welding Society, 33 W. 39th St., New York 18, N. Y. ..... **SEPTEMBER 28-OCTOBER 1, 1959.**

AGA CONVENTION—Annual convention of the American Gas Association, at the Conrad-Hilton Hotel, Chicago, Ill. C. S. Stackpole, managing director of the Association, 420 Lexington Ave., New York 17, N. Y. ..... **OCTOBER 5-7, 1959.**

ASA CONFERENCE—10th National conference on Standards, at the Sheraton-Cadillac Hotel, Detroit, Mich. Secretary of the Association, 70 E. 45th St., New York 17, N. Y. ..... **OCTOBER 20-22, 1959.**

ARI EXPOSITION—11th Exposition of the Air-Conditioning and Refrigeration Industry at Convention Hall, Atlantic City, N. J. Geo. S. Jones, Jr., managing director of Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C. ..... **NOVEMBER 2-5, 1959.**

HOTEL EXPOSITION—National Hotel Exposition, New York Coliseum, New York, N. Y. ..... **NOVEMBER 2-6, 1959.**

COMMERCIAL KITCHEN PLANNING—Seminar on commercial kitchen planning at Michigan State University, East Lansing, Mich. Ralbern H. Murray, American Gas Association, 420 Lexington Ave., New York 17, N. Y. ..... **NOVEMBER 9-13, 1959.**

WARM AIR HEATING CONVENTION—Annual convention of the National Warm Air Heating and Air Conditioning Association, at the Chase Hotel, St. Louis, Mo. G. Boeddener, managing director of the Association, 640 Engineers Bldg., Cleveland 14, Ohio. ..... **DECEMBER 1-4, 1959.**

ASHRAE MEETING—Semi-annual meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, and the 2nd Southwest Heating and Air-Conditioning Exposition, sponsored by ASHRAE, in Dallas, Tex. The meeting will be at the Baker and Adolphus Hotels, and the Exposition in the Memorial Auditorium. Secretary of the Society, 62 Worth St., New York 13, N. Y. ..... **FEBRUARY 1-4, 1960.**

GAMA MEETING—Annual Meeting of the Gas Appliance Manufacturers Association, at The Greenbrier, White Sulphur Springs, West Va. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. ..... **MARCH 30-APRIL 1, 1960.**

CONGRESS ON OCCUPATIONAL HEALTH—13th International Congress on Occupational Health, first to be held in the Western Hemisphere, at the Waldorf Astoria Hotel, New York City. Dr. Leo Wade, organizing committee, 15 W. 51st St., New York 19, N. Y. ..... **JULY 25-29, 1960.**

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More than 100 International-LaMont
HIGH TEMPERATURE WATER GENERATORS

(Total hourly capacity over two and one-half Billion Btu)

All of these users saved 15-18% in installation costs alone over comparable high pressure steam systems — and they are continuing to save 13-20% in operating costs and 50-60% in maintenance costs. These same savings can be yours.

INDUSTRIAL & COMMERCIAL
Douglas Aircraft Corp.
Continental Can Co.
Union Carbide Nuclear Co.
Behr-Manning Co.
Johnson & Johnson
American Airlines Inc.
Bethlehem Steel Co.
New York International Airport
Ohio National Life Insurance Co.
Trans-Canada Air Lines
Bethlehem Pacific Coast Steel Co.
International Min. & Chem. Corp.

HOSPITALS
N. E. Florida Mental Hospital, Fla.
The Children's Hospital, Ohio
Bronx State Hospital, N. Y.
Loring AFB Hospital, Me.

SCHOOLS & UNIVERSITIES
Rutgers University, N. J.
Hilltop Elem. School, Ohio
American River Jr. College, Cal.
Madeira High School, Ohio
Brigham Young University, Utah
Indian Hill Elem. School, Ohio
Holy Apostles School, Wisc.
Maple Park Elem. School, Ohio
Everett High School, Mich.
Avondale Elem. School, Ohio
Utica Jr. High School, Mich.
Whitewater High School, Wisc.
College of Great Falls, Mont.
The Colorado College, Colo.
St. Joseph Seminary, La.

Plus 21 U. S. Air Force and Navy Bases.

Get full details from your INTERNATIONAL DISTRICT REPRESENTATIVE or write for Bulletins 700 and 1000 today.

BOILER BUILDERS SINCE 1886

THE INTERNATIONAL BOILER WORKS CO.

890 Spruce St. East Stroudsburg, Pa.

Steel Firebox Welding & Power Gilbert Low & High Pressure Water Tube Package Boilers • International-LaMont Forced Recirculation Generators • ASME Code Pressure Vessels & Welded Products.

Manufactured in Canada by Canadian Vickers, Ltd., Montreal, P. Q.

CLASSIFIED ADVERTISING

Sold at $12 per column inch.

WANTED
INDUSTRIAL PUMP, SALES AND APPLICATION ENGINEER

An exceptional opportunity with a well-known manufacturer of heat exchangers, pumps and allied equipment for heating and air conditioning. This well-known New England firm is looking for a man with experience in sales engineering of industrial centrifugal pumps, for heating, cooling and other industrial applications. A mechanical engineering degree is desirable, but equivalent pump experience would be considered. Salary commensurate with experience and qualifications. Send your resume now including salary history and expectations. Replies kept confidential. Address, Box 941, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

WANTED MECHANICAL ENGINEER

Large midwest Chemical Company offers excellent opportunity for a young Mechanical Engineering graduate who has a few years experience in one or more of the following fields: Plant Engineering, Design of air heating ventilation and air conditioning systems, Design or maintenance of automatic packaging machinery or design or maintenance experience on power plant equipment. Long terms opportunities with an expanding organization. Ability to assist in a certain amount of staff engineering important. Send complete resume, with salary requirements to Box 939, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

WANTED ELECTRICAL ENGINEER

Large midwest chemical company offers a challenging opportunity for an experienced plant electrical engineer. Will be responsible for the coordination of the engineering phases of electrical power, generation and distribution; consult on technical problems requiring electrical and mechanical knowledge; responsible for operations of plant electrical systems also improvements and expansion. Must have Electrical Engineering degree and five years' experience. Prefer professional engineers license. Send resume, including salary requirements to Box 940, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

MANUFACTURERS' AGENTS

An established manufacturer with 25 years experience producing ventilating equipment is looking for manufacturer's agents in many sections of the country to sell their new line of industrial fans. The products include axial flow and tubeaxial fans, both direct and belt driven, and power roof ventilators.

Please reply Box 914, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

NAME PLATES

Engraved laminated Lamicoid or Phenolic plastic name plates for identification of controls, switches, valves, etc. Plates are black with white engraved characters and beveled to show white border. Colors also available. Send for sample and price list. Southern Name Plate Company, 4601 Lafaye St., New Orleans 22, La.

PRINTED FORMS available for immediate shipment. Heating & oil burner materials form, burner service record cards, service order forms, inspection information form, survey sheet and others. Also can supply BURNER SERVICE form in 8 part EZE SNAP with 3 carbons in each set, 1200 sets Imprinted with your name, address and telephone, only $20.40. Send for samples—no obligation. Write Dept. AC, Degree Day Systems, 39-30 58th St., Woodside 77, N. Y.

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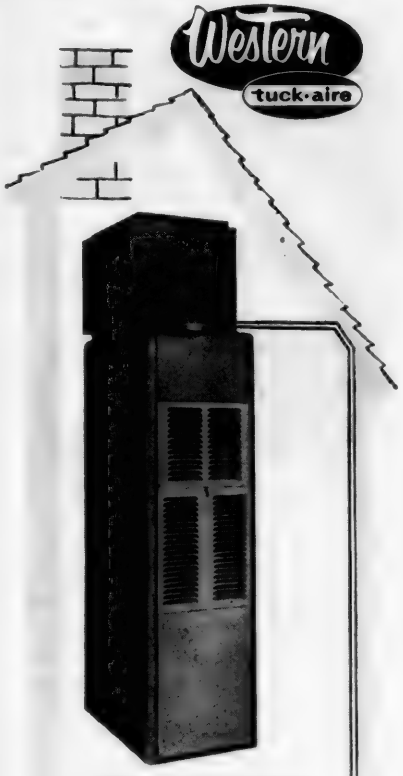
The New Look In Year Around Air Conditioning



1. Filtered Forced Air Gas Furnaces
2. Counter-Flo or Up-Flo-Twenty-four Models
3. Heating Capacities—60,000 to 250,000 BTU
4. Cooling Capacities—Two to 7½ Tons
5. Air Cooled Remote Condensing Units
6. Matching Evaporator Coils

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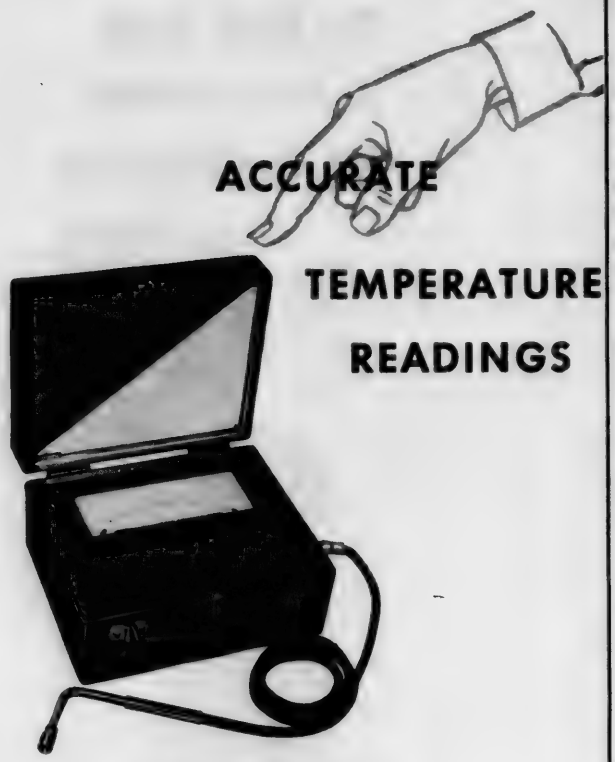
2045 Evans Avenue • San Francisco, Calif.

"PIONEERS AND LEADERS IN AIR CONDITIONING COMFORT"



ACCURATE TEMPERATURE READINGS

- Hot Water Systems
- Floors, Walls, Ceilings
- Refrigerated Coils
- Insulation
- All Other Low Temps.

You can accurately read any low surface temperature with the Alnor Type 2300 Surface Pyrometer—in 3 to 5 seconds.

Take this rugged, portable instrument to any job in the field and see how performance to laboratory standards can save invaluable time in balancing out a system...save the money lost on call-backs. Large 6" mirrored scale is direct reading, no conversion...no errors in readings ..1° per division. Precision jeweled movement is protected against abuses of portable service by sturdy walnut case. Comes complete with matched thermocouple and lead ready to use on your next trip out. Send for Bulletin 4257 and get the complete story on the full line of Alnor Pyrometers. Just tear out this ad and mail on your letterhead to: Illinois Testing Laboratories, Inc., Room 514, 420 N. LaSalle St., Chicago 10, Ill.

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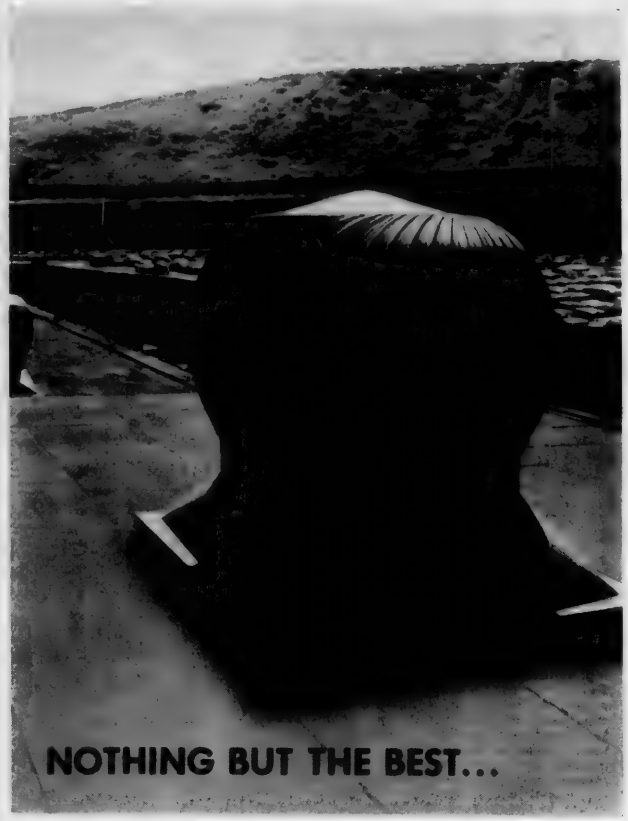
PRECISION INSTRUMENTS FOR EVERY INDUSTRY



Western Rotary® Roof Ventilators

with Lifetime Guaranteed Bearings

- "Backward curved blower wheel" type mechanism assures high, constant exhaust capacity, no backdraft ever.
- Certified wind tunnel tests by non-commercial national institute.
- Unique factory lubricated sealed bearings are specially designed for positioning load, countering wind pressure, assuring stability.
- Lock-on rotor, yet removable without special tools.
- Exclusive Western corrugated vane increases rigidity.
- Low, functional type adds beauty.
- Baked enamel paint coating for beauty and long life.
- Aluminum, copper, or stainless steel construction available.

Other type ventilators include:

- Stationary
- Directional
- Continuous ridge
- Vertical exhaust
- Axial roof
- Unit ventilators

Immediate Delivery on all sizes

Complete Catalog in Sweets and Western States A-E-C

Write for catalog and name of nearest representative.

WESTERN ENGINEERING & Mfg. Co.

4108 Glencoe Avenue, Venice, California

Since 1921...a reliable leader.

Ad-Digest

AND PRODUCT INFORMATION SERVICE

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail a prepaid multipurpose postcard, either of two that appear on the yellow page following, to request further information from manufacturers.

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement.

NOTE: All advertisements are digested here except those received too late for inclusion. The Index of Advertisers lists all of the advertisements in this issue.

COMBINATION GAS-OIL BURNERS ...
from Ray Burner Co. lead in acceptance and service. Rotary types, forced draft types, and power pressure types are available. Catalog data are offered.
Inside Front Cover Item 200

THESE STEAM TRAPS .....
are designed especially for heating systems. Armstrong open float and thermostatic steam traps are engineered for low pressure intermittent service where large amounts of air accumulate while steam is off. Two bulletins are offered.
Page 1 Item 201

GALVANIZED STEEL SHEETS .....
from Wheeling Steel Corp. will not flake or peel. Anything that can be made of steel sheets can be made of this product. Information is available.
Page 2 Item 202

SUPER-DRY REFRIGERANTS .....
known as Genetrons are approved, accepted and preferred for the air conditioning and refrigeration needs of bowling alleys and banks, bakeries and beauty parlors. Information is available.
Page 5 Item 203

AXIAL FLOW FANS .....
for exhaust of fumes and vapors are available from Westinghouse. Units are ready for in-line mounting in duct or stack. Information is available.
Page 7 Item 204

NEW WROUGHT IRON .....
has self-fluxing action which contributes to sound, durable welds. Wrought iron welding fittings are also available from A. M. Byers Co. Welding booklet is offered.
Page 9 Item 205

FLUSH VALVES .....
from Coyne & Delaney Co. will provide a future of faultless service for the curtain-walled Chase Manhattan Bank Building in New York City. Information is available.
Page 11 Item 206

STORAGE WATER HEATERS .....
built by Patterson-Kelley and factory-lined with Pre-Krete are fully guaranteed on workmanship and materials. On-the-site lining is also available through network of franchised applicators. Catalog is offered.
Page 13 Item 207

CONDENSING UNIT .....
from Bell & Gossett Co. is an achievement in compact, quiet efficiency. All major parts are made and guaranteed by this manufacturer. Literature is available.
Page 15 Item 208

PNEUMATIC CONTROLS .....
from Johnson Service Co. are providing an ideal working climate in the award winning Lambert-Hudnut plant in Lititz, Pa. Information is available.
Pages 16-17 Item 209

AIR COOLED CONDENSERS .....
are offered by McQuay, Inc., in a choice of vertical or horizontal air flow. Unlimited tonnage is available with multiple installations. Information is available.
Page 18 Item 210

TWO PUMPS .....
offering more capacity and more performance are available from Skidmore Corp. They are described in two bulletins which are available from the company.
Page 19 Item 211

WITH GAS AIR CONDITIONING .....
from York Corp., our boilers keep us cool all summer. So states President Mather of the Allen Manufacturing Co., makers of hex-socket screws. Information is available.
Pages 20-21 Item 212

92 AIR HANDLING UNITS .....
from Dunham-Bush, Inc., solved the comfort computation at IBM's new engineering laboratory at Kingston, N. Y. They cool, heat, filter or dehumidify air. Information is available.
Page 23 Item 213

AIR DIFFUSION EQUIPMENT .....
from Waterloo Register Co., Inc., is described in new, fully illustrated, color keyed 58-page catalog which is available from the company.
Page 24 Item 214

COMMERCIAL WATER HEATERS .....
for every large-volume need are available from A. O. Smith Corp. Gas-fired units are performance proven. Company's Architect's Manual is offered.
Page 25 Item 215

AUTOMATIC REGULATING VALVES ...
can have a costly down-time. Ad, by Spence Engineering Co., Inc., gives three tips for low maintenance of these valves. More information is offered in a bulletin which is available.
Page 26 Item 216

AIR CONDITIONING EQUIPMENT ....
from The Governair Corp. is called "Satisfabricated." Equipment can be manufactured to fit almost any space and load requirement. Information is available.
Page 27 Item 217

ARI SEAL BOOKLET .....
explains Seal of Certification program of Air-conditioning and Refrigeration Institute for unitary air conditioning equipment, your guarantee that the unit's rated capacity is in accordance with ARI Standards. A directory of manufacturers participating in the program is included.
Page 28 Item 218

MAINTENANCE-FREE PUMPS .....
are offered by Buffalo Pumps for boiler feed and other high pressure, high temperature applications with clear water. Bulletin is offered.
Page 29 Item 219

Ad-Digest

AND PRODUCT INFORMATION SERVICE

Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail a prepaid multipurpose postcard, either of two that appear on the yellow page following, to request further information from manufacturers.

CAST IRON GAS BOILERS .....
from Weil-McLain Co. heat the University of Kentucky's handsome student housing project. Performance and dependability characteristics influenced selection. Descriptive literature is available.
Page 30 Item 220

DUAL DUCT SYSTEM .....
from Buensod-Stacey permits balancing a building before it's built. Air mixing units can be pre-set at the factory for desired volume and guaranteed within plus or minus 5%. Information is available.
Page 31 Item 221

TROUBLE-FREE VALVES .....
from Jenkins Bros. were specified for one of the ten "Top Plants of 1956", the P. Lorillard plant at Greensboro, N. C. Information is offered.
Page 32 Item 222

TEMPERATURE CONTROL .....
from The Powers Regulator Co. is providing year-round air conditioned comfort for prominent New York buildings. Control centers provide the ultimate in indoor climate or process automation. Information is available.
Insert 33-36 Item 223

ZONE CONTROL CABINETS .....
from Buffalo Forge Co. simplify your air conditioning installations. Quiet, highly efficient units provide varying degrees of conditioned air for several zones. Bulletin is offered.
Page 37 Item 224

PERFECT AIR DIFFUSION .....
for electronic computers is provided by Anemostat air diffusers. High heat return from equipment and lighting is efficiently controlled. Selection manual is offered.
Page 38 Item 225

HEAT EXCHANGERS .....
for radiation and water heating are offered by Bell & Gossett Co. They assure not only high efficiency but also highest quality construction. Three catalogs are offered.
Page 39 Item 226

THERMO EXPANSION VALVES .....
from Alco Valve Co. offer the widest variety of body styles and connections. Connections need not be broken to change capacity or to clean. Specifications bulletin is available.
Page 40 Item 227

LOW VOLTAGE MOTOR CONTROL ....
line from Allis-Chalmers offers unsurpassed mechanical and electrical life. Performance tests confirm quality. Information is available.
Page 41 Item 228

AIR CONDITIONING EQUIPMENT ....
selection should be discussed with an engineer. American-Standard's Industrial Division is engineer-staffed from brass to branches. Information is available.
Pages 42-43 Item 229

PRESSURE, TEMPERATURE CONTROLS
for air conditioning and refrigeration applications are available from Allen-Bradley Co. They offer longer life, lower differentials and attractive appearance. Information is available.
Page 44 Item 230

COOLING TOWERS .....
from Halstead & Mitchell boast a twenty-year guarantee. Specially treated wood decking resists rotting, fungus attack, and algae which accumulates and obstructs air flow in most other towers. Information is available.
Page 45 Item 231

COPPER TUBE .....
permits easier remodeling, according to The American Brass Co. Anaconda copper tube and fittings for soil, waste and vent lines cut installation time one-third to one-half. Information is available.
Page 46 Item 232

CONTROLLED CLIMATE .....
by Chrysler tames Houston's heat at Dresser Electronics Center. Four Airtemp centrifugal units do the job and offer other important benefits. Information is offered.
Page 47 Item 233

WHILE BLOWERS AND FANS .....
with up to 86-inch wheel diameters are manufactured by Peerless Electric, smaller units have their place too. Catalogs are offered.
Page 48 Item 234

HEATER LEASE PLAN .....
is offered by Dravo Corp. for those who need a modern, economical heating system to further plant expansion or modernization plans, but need to conserve working capital. Information is offered.
Page 49 Item 235

SHOWER CONTROL .....
from Lawler is completely recessed into the wall. The Recesso thermostatic shower mixing valve offers complete safety. Information is available.
Page 50 Item 236

PACKAGED INDUSTRIAL FANS .....
featuring flat radial blade wheels are offered by The New York Blower Co. to cope with virtually any industrial air or material handling problem. Bulletins are available.
Page 51 Item 237

ANY TYPE OF COOLING .....
problems, industrial or commercial, can be solved by Frick Co. engineers who will design, build and install the company's systems. Information is available.
Page 52 Item 238

ONE-PIECE PIPE INSULATION .....
from Gustin-Bacon Mfg. Co. snaps quickly on pipe or tubing. Its thermal efficiency rates at the top of all general purpose pipe insulations, and is permanent. Information is available.
Page 53 Item 239

ZONE COOLING PLAN .....
from York Corp. provides the perfect answer to budget-conscious prospects who want air conditioning but imagine they can't afford it. Information is available.
Page 54 Item 240

POWER ROOF VENTILATOR .....
from Clarage Fan Co. requires no floor space, has minimum installation cost, and unequalled accessibility. Bulletin is offered.
Page 55 Item 241

COPPER TUBE .....
from Chase Brass and Copper Co. is being used in the new Time and Life Building. Contractor is using an efficient prefabrication technique. Information is available.
Page 113 Item 242

AIR DIFFUSERS .....
with diffusing vanes are custom made by Air Devices, Inc. Unlimited louver patterns provide draftless air distribution. Catalog is offered.
Page 114 Item 243

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement. All advertisements are digested here except those that are received too late for inclusion in this listing.

Ad-Digest

AND PRODUCT INFORMATION SERVICE

CENTRAL STATION .....
air conditioning units from Drayer-Hanson are modular constructed and have inside motor mounting. Time saving fan performance curves are offered.
Page 116 Item 244

SIX BOILER-BURNER UNITS .....
replaced three big boilers at the Masonic Temple in Dayton, Ohio. Advantages of Petro small package firing are listed in ad. Additional information is available.
Page 117 Item 245

AIR CONDITIONING SYSTEM .....
modernization at the Plaza Hotel in Houston called for Thermal multi-zone units. Detailed catalog is available.
Page 118 Item 246

RESILIENT MOUNTED MOTORS .....
from Wagner Electric Corp. in sleeve or ball bearing models are vibration free and offer extra quiet operation. Information is available.
Page 119 Item 247

ELECTRONIC CONTROLS .....
for smaller buildings are offered by Minneapolis-Honeywell. Available for multi-zone air conditioning, single-zone air conditioning, and the thermostat on the wall. Information is offered.
Insert bet. 120-124 Item 248

ELECTRONIC AIR CLEANER .....
from Minneapolis-Honeywell offers flutter-jet washing. It removes 95% of all airborne dirt. Information is offered.
Insert bet. 120-124 Item 249

INSULATING FIRE BRICK .....
from Gem Clay Forming, Inc., has been perfected to withstand temperatures up to 2600 deg. F. Descriptive booklet is available.
Page 124 Item 250

SCOTCH-TYPE STEEL BOILERS .....
from Burnham Corp. are heating an outstanding new department store. Two packaged units do the job. Information is available.
Page 125 Item 251

BOILER WATER LEVEL CONTROLS ....
are reported by Magnetrol, Inc., to be the safest as well as simplest devices available. Operating life is almost unlimited. Information is available.
Page 126 Item 252

INDUSTRIAL HEATERS .....
from Lennox Industries, Inc., operate equally well with either gas or oil, and, in addition, have "push button" changeover. Engineering data are offered.
Page 127 Item 253

MAN-COOLING FANS .....
in strategic locations increase worker efficiency and comfort, according to the manufacturer, Aerovent Fan Co., Inc. Bulletin is available.
Page 128 Item 254

HEAVY DUTY BOILERS .....
are listed in Bryan Steam Corp.'s line for every steam or water heating application up to 1.8 million Btu per hr output. Information is available.
Page 129 Item 255

FIVE ATOMIC SUBS .....
use Weksler instruments to indicate and record temperature, pressure and humidity. Condensed instrument bulletin is offered.
Page 129 Item 256

SPRING CLOSES STEAM TRAP .....
when thermostat is damaged, says manufacturer, Sterling, Inc. Trouble is located immediately because radiation becomes cold. There is no waste of steam. Information is available.
Page 130 Item 257

CEILING DIFFUSERS .....
with 18 different deflection patterns are offered by A-J Mfg. Co. Special air distribution problems are solved quickly and economically. Catalog is available.
Page 131 Item 258

PLASTIC LEAD SEAL .....
from Crane Packing Co. is the most economical all-purpose sealing compound for pipe joints, studs and gaskets. Information and sample are available.
Page 131 Item 259

PORTABLE GAS ANALYZER .....
from Thermco Instrument Corp. gives accurate carbon dioxide readings in 20 seconds. Saves fuel dollars on large and small furnaces. Information is available.
Page 131 Item 260

HYDROSTATIC SHOCK CONTROL ....
produced by J. R. Smith, controls water pressure with pneumatic pressure. Provides a more effective and efficient way to control hydrostatic shock and eliminate water hammer in any hot or cold water piping system. Booklet is available.
Page 132 Item 261

THIS PROPELLER VENTILATOR .....
from Loren Cook Co. moves up to 18,570 cfm quietly. It costs less than centrifugal flow unit. Catalog is offered.
Page 133 Item 262

NO FILTER .....
does all jobs or meets every need. That's why filters from Air Filter Corp. are engineered to the job to offer more effective dust collection. Bulletins are available.
Page 133 Item 263

EXTRUDED ALUMINUM SHUTTERS ....
from Elgo Shutter & Mfg. Co. are of modern design, light weight, fully weather-stripped, easier to install, and are rust and corrosion proof. Complete specifications are available.
Page 133 Item 264

DUCT-SEALING TAPE .....
from Arno Adhesive Tapes, Inc., provides the fastest, easiest way to seal ducts and apply insulation. Free sample, information are offered.
Page 133 Item 265

FAN ENGINEERING DATA .....
are offered in booklet published by Quickdraft Corp. which discusses low cost heating plant power-draft and industrial exhausting.
Page 134 Item 266

POSITIVE SEALING INDICATORS .....
made by Allin Mfg. Co. proven on thousands of production line installations have one piece extension gasket for positive sealing and fool-proof assembly. Six sizes. Complete line catalog available.
Page 135 Item 267

Ad-Digest

AND PRODUCT INFORMATION SERVICE

Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail a prepaid multipurpose postcard, either of two that appear on the yellow page following, for further information from manufacturers.

VENTILATING BRICKS .....
and blocks in cast aluminum are an ideal air intake for unit air conditioners. According to Construction Specialties, Inc., they are neat, sturdy, economical and efficient. Catalog is offered.
Page 135 Item 268

REMOTE CONTROL CENTERS .....
from Barber-Colman have been improved by new modular electronic components. Combinations of standard components meet any temperature and humidity control application. Information is available.
Pages 136-137 Item 269

COMFORT CHART CONDITIONS .....
are guaranteed with Barber-Colman automatic controls and air distribution components working together in a combination system. Literature is available.
Page 137 Item 270

SCREENLESS PUMPS .....
for sewage and drainage pumping, with a real non-clog impeller, are offered by Weil Pump Co. Bulletin describes them.
Page 138 Item 271

GAS UNIT HEATERS .....
from Reznor Mfg. Co. are designed and built for long life and reliable service. Company offers a booklet entitled "Modern Heating."
Page 139 Item 272

SILENCERS .....
from Elof Hansson, Inc., effectively reduce airborne noise generated by fans in air conditioning, ventilating systems and by power roof ventilators. Literature and silencer selection chart are offered.
Page 139 Item 273

DUCT INSULATION ADHESIVE .....
from Cain Manufacturing Co. is formulated especially for bonding to metal ducts. Though economical, it contains all the qualities desired for an immediate, strong and lasting bond. Information is available.
Page 139 Item 274

FOR PUMPING SEWAGE .....
and other liquids containing solids, and for sump pump applications, Chicago Pump Co. offers its new submersible, non-clog sewage and sump pump. Information is available.
Page 140 Item 275

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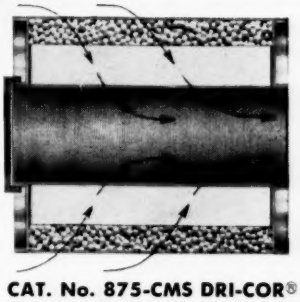

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